PATHOLOGICAL HISTOLOGY.

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ATLAS

OF

PATHOLOGICAL HISTOLOGY.

BY

Dr. GOTTLIEB GLUGE,

PROFESSOR OF PHYSIOLOGY AND PATHOLOGICAL ANATOMY IN THE UNIVERSITY OF BRUXELLES;
MEMBER OF THE ROYAL ACADEMY OF SCIENCES OF BRUXELLES, ETC.

TRANSLATED FROM THE GERMAN,

BY

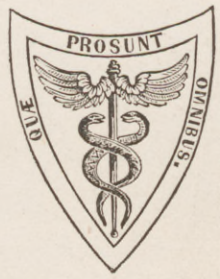
JOSEPH LEIDY, M.D.,

PATHOLOGIST TO ST. JOSEPH'S HOSPITAL, PHILADELPHIA; FELLOW OF THE COLLEGE OF PHYSICIANS, PHILADELPHIA;
HONORARY FELLOW OF THE MEDICAL SOCIETY OF VIRGINIA; CORRESPONDING MEMBER OF THE BIOLOGICAL SOCIETY OF PARIS, ETC. ETC.

WITH THREE HUNDRED AND TWENTY FIGURES,

PLAIN AND COLORED,

On Twelve Copperplate Engravings.



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TRANSLATOR'S PREFACE.

No apology can be necessary for presenting to the medical profession in the United States the translation of a work upon a subject relatively so new to the science of medicine as pathological histology. Its importance to pathological anatomy is of the same character as normal histology is to normal anatomy, and this cannot be better represented than by referring to the great and permanent advance which physiology has made in its relation to the physical structure of the organs of the living body. Pathological anatomy also is beyond doubt of the highest value in medicine, for a scientific treatment of disease must of necessity depend to a very considerable extent upon our knowledge of material changes which are so frequently the source of those symptoms which indicate its existence.

The present volume of Gluge, originally appended to his great work on pathological anatomy, besides illustrating the various subjects of pathological histology, accompanied by copious references, will be found of particular interest from the light which is thrown upon the inflammatory process and its various attendant and accessory phenomena.

Unaccustomed to translate German for publication, I hope the value of the material disclosed to the view of those unacquainted with the language will be sufficient excuse for any inelegancy of expression or occasional inaccuracy.

Additions to the original work are inclosed within brackets [ ].

PHILADELPHIA,
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INTRODUCTION.

TABLES OF THE MAGNITUDE AND WEIGHT OF THE ORGANS OF MAN IN THE NORMAL AND ABNORMAL CONDITIONS.[1]

THE time is past in which alterations in the magnitude and weight of organs in disease were estimated from their outward appearance alone; and it is no longer satisfactory to compare the heart of an individual with his fist to determine whether or not it is hypertrophied. The introduction of the scales to aid in the investigations of pathological anatomy, though not capable of producing such a revolution as they have done in chemistry, yet they must furnish important results, especially when the observations are numerous, and made at periods of every ten years of the life of individuals of both sexes, as proposed by Quetelet, to whom I am myself particularly indebted for being induced to make such researches.

In order, however, to become familiar with the alterations in size and weight produced in organs by disease, it is necessary to be acquainted with their normal condition in these respects. Nevertheless, to succeed in this is difficult, for I deem it essential that all the important organs in an individual should be healthy, and not merely the one examined; for the reciprocal influence of organs during life is too great to lead to correct results without their general condition being taken into consideration. It is from neglect of this view that the best manuals on anatomy vary so much in their statements of the relative weights of many organs. Thus we find, in the excellent treatise, by Huschke, on the abdominal viscera, the assertion that the liver usually weighs four pounds, and not unfrequently more, and even up to six pounds. These numbers are much too high for the normal condition of that organ.

The only opportunities afforded us to become acquainted with the healthy condition of the organs are in cases of accidental death, suicide, and executed criminals; but even among these we find only a small number to answer the purpose, and, therefore, knowledge of this character is to be obtained only after a long series of observations. The first table below will form a commencement towards such a series, and in the appended notes I have described the external appearances of the organs, for I am convinced that but few physicians, or even anatomists, are familiar with many of them in their healthy condition—as, for instance, the liver, the intestinal canal during chylification, &c.—and I find it quite common for normal appearances to be mistaken for morbid ones.

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[1] The measurements and weights in this work are given, according to the French decimal system, in metres and grammes. The metre and its technical divisions, reduced into English measurement, are as follows:—

Metre	39.37100	inches.
Decimetre	3.93710	"
Centimetre	.39371	"
Millimetre	.03937	"

For ordinary purposes, the metre may be considered to be equal to 40 inches, the decimetre to 4 inches, the centimetre about two-fifths of an inch, and a millimetre about half a line.

The gramme, and its divisions, in troy weight, are as follows:—

Gramme	15.4440	grains.
Decigramme	1.5444	"
Centigramme	.1544	"
Milligramme	.0154	"

Or, ordinarily, a gramme may be considered to be about 15½ grains, etc.—TRANS.

TABLE I.

MEASUREMENT OF THE INTERNAL ORGANS OF THE HEALTHY HUMAN BODY.

	I.	II.	III.	IV.	V.
Subject	Male.	Male.	Male.	Male.	Male.
Occupation	Tailor.	Laborer.	Baker.	Servant.	
Cause of death	Executed for murder.	Executed for murder.	Suicide by shooting.	Executed for murder.	Suicide by shooting.
Age	29 years.	21 years.	26 years.	21 years.	33 years.
Height of the body	1,m680	1,m700	1,m700	1,m580	1,m700
Weight of the body	—	64 kilogr.	—	54 kilogr.	60 kilogr.
Breadth at the shoulders	0,m352	0,m345	—	0,m368	0,m330
Breadth at the axillæ	0,232	0,235	—	0,286	0,260
Breadth at the middle of the thorax	0,262	0,262	—	0,282	0,255
Distance between the nipples	0,190	0,198	—	0,200	0,185
Antero-posterior diameter from the spinous processes to the manubrium sterni	0,120	0,130	—	0,122	0,131
Antero-posterior diameter at the middle of the sternum	0,188	0,220	—	0,200	0,190
Circumference of the thorax at the axillæ	0,925	0,950	—	0,844	0,840
Circumference of the thorax at the middle of the sternum	0,964	1,040	—	0,845	0,820
Weight of the left lung distended with air	244,75 gramm.	248,37	—	156	553
Weight of the right lung distended with air	279,16	276,61	—	168	600
Diameter of the trachea just before bifurcating in the bronchi	0,m011	0,m018	—	0,m018	0,m018
Weight of the heart	275,34 gramm.	275,34	320	250	320
Length of the ventricles from the origin of the aorta to the apex of the heart	0,m125	0,m100	0,m120	0,m98	0,m110
Breadth of the left ventricle at its middle	0,051	0,070	0,114	0,038	0,070
Breadth of the right ventricle	0,042	0,044		0,060	0,060
Circumference of the heart at its base	0,200	0,245	0,230	0,220	0,240
Circumference of the heart at its middle	0,244	0,260	0,250	0,182	0,230
Circumference of the heart near the apex	0,140	0,160	0,140	0,125	0,100
Circumference of the aorta at its origin	0,082	0,068	0,070	0,064	0,060
Diameter of the aorta at its origin	0,m030	0,030	0,031	0,028	—
Inner circumference at the orifice of the aorta	—	—	—	0,053	—
Circumference of the pulmonary artery	0,080	0,068	0,070	0,072	0,074
Inner circumference at the orifice of the pulmonary artery	—	—	—	0,060	—
Diameter of the pulmonary artery	0,033	0,030	0,028	0,033	—
Thickness of the parietes of the left ventricle, inclusive of the columnæ carneæ	0,020	0,024	—	0,030	—
Thickness of the parietes of the left ventricle, exclusive of the columnæ carneæ	0,016	0,020	0,015	0,020	0,018
Height of the mitral valve	0,028	0,030	0,030	0,020	0,035
Inner circumference of the left ventricle	0,135	0,130	0,150	0,090	0,110
Inner circumference of the left auriculo-ventricular orifice	0,092	0,114	—	0,078	0,080
Height of the semilunar valves of the aorta	0,020	0,022	0,018	0,018	0,020
Height of the semilunar valves of the pulmonary artery	0,020	0,022	0,018	0,018	0,020
Thickness of the parietes of the right ventricle	0,007	0,010	0,005	0,007	0,006
Thickness of the septum of the ventricles	0,020	0,020	0,026	0,018	0,032
Thickness of the parietes of the left auricle	0,004	0,004	0,002	0,0025	0,004
Thickness of the parietes of the right auricle	0,002	0,003	0,001	0,0015	0,002
Height of the tricuspid valve	0,025	0,030	0,025	0,032	0,035
Inner circumference of the right ventricle	0,175	0,200	0,145	0,130	0,130
Inner circumference of the right auriculo-ventricular orifice	0,118	0,120	—	0,100	0,100
Weight of the liver	1145,32 gramm.	1550,70 gramm.	—	1270	1450
Length of the liver	0,m150	0,m178	—	0,m182	0,m168
Antero-posterior diameter of the right lobe	0,110	0,130	—	0,170	0,115
Antero-posterior diameter of the left lobe	0,288	0,261	—	0,260	0,222

TABLE I.—Continued.

	I.	II.	III.	IV.	V.
Subject	Male.	Male.	Male.	Male.	Male.
Occupation	Tailor.	Laborer.	Baker.	Servant.	
Cause of death	Executed for murder.	Executed for murder.	Suicide by shooting.	Executed for murder.	Suicide by shooting.
Age	29 years.	21 years.	26 years.	21 years.	33 years.
Circumference of the right lobe	0,350	0,422	—	0,392	0,370
Circumference of the left lobe	0,210	0,319	—	0,310	0,240
Weight of the pancreas	76,49 gramm.	91,^{78} gramm.	—	72 gramm.	—
Length of the pancreas	—	—	—	0,m210	—
Weight of the spleen	206,^{50}	214,^{15}	—	158	115
Length of the spleen	0m,150	0,m141	—	0,m150	0,m090
Breadth of the spleen	0,088	0,095	—	0,074	0,050
Circumference of the spleen	0,190	0,193	—	0,156	0,150
Weight of both testicles	53^{54} gramm.	64,^{84} gramm.	—	52 gramm.	50 gramm.
Weight of the right kidney	122,^{38}	107,^{08}	—	123	140
Weight of the left kidney	122,^{38}	124,^{38}	—	132	140
Length of the right kidney	9,113	0,m100	—	0,m101	0,m110
Length of the left kidney		0,119	—	0,088	0,110
Breadth of the right kidney at its hilum	0,055	0,048	—	0,052	0,045
Breadth of the left kidney at its hilum		0,049	—	0,050	0,040
Circumference of the right kidney	0,145	0,122	—	0,110	0,130
Circumference of the left kidney		0,150	—	0,132	0,120
Thickness of the cortical substance of the right kidney	0,012	0,009	—	0,011	0,010
Thickness of the cortical substance of the left kidney				0,007	—
Thickness or length of the medullary substance of the right kidney	0,021	0,016	—	0,010	0,017
Thickness or length of the medullary substance of the left kidney				0,018	—
Length of the small intestine	—	—	—	7,695	—
Inner circumference of the small intestine	—	—	—	0,075	—
Length of the large intestine	—	—	—	2,280	—
Inner circumference of the colon	—	—	—	0,160	—
Weight of the cerebellum	1437 gramm.	1336 gramm.	—	1112 gramm.	1200 gramm.
Weight of the pons Varolii	21	21	—	23	155
Weight of the cerebellum	171	171	—	135	
Weight of the spinal cord	—	—	—	25	

Remarks.—The organs were found also to be normal microscopically, with a few deviations to be specified. The individuals I. and II. were executed on the 9th of February, 1847, and number IV. on the 25th of October, 1847. Their bodies were received for examination immediately after the execution.

Cases I. and II. The heart empty, with little fat upon the right ventricle and in the furrows; much fat upon the pericardium. The color of the lungs pale red mixed with little black pigment, with slight adhesions only, without a trace of tubercles. The liver was yellowish-brown, and exhibited a pale-yellowish reticulated structure, the areolæ of which were filled with a reddish substance. The hepatic cells were $\frac{1}{40}$ of a millimetre in diameter, and inclosed granules soluble in ether; from 8 to 10 in Case II., but in smaller quantity in Case I. The kidneys presented the medullary substance pale-red; the cortical substance pale-yellowish, marbled with red, and smooth, the yellow substance appearing net-like, and in bands from $\frac{1}{4}$ to $1\frac{1}{4}$ millimetres broad. The tubuli uriniferi were $\frac{6}{100}$ of a millimetre in diameter. The spleen exhibited the Malpighian corpuscles filled with a milky liquid. Cases I., II., and III. present good examples of a fine and powerful development of the muscular system.

Case IV. Both lungs attached by their apex to the ribs, without tubercles, of a red color, with slate-gray spots. The left ventricle strongly contracted, very hard; the right ventricle softer, dilated, covered by adipose tissue. The pericardium contained hardly a teaspoonful of liquor pericardii. The liver reddish-brown, in section reticular. The yellow bands of the reticular structure were $\frac{3}{4}$ to 1 millimetre in diameter, and formed rhombic spaces, separated by clearer and broad furrows $\frac{1}{4}$ of a millimetre broad. The furrows contained the hepatic ducts and vessels. Every rhombic space was perforated by an opening, through which the blood exuded. The cells contained some fat globules. The medullary substance of the right kidney was red, instead of being pale, as in the left kidney. This individual had been ill with typhus

fever,[1] and was restored to health a month before his execution. Some reticulated plaques of Peyer near the ileo-cæcal valve appeared to be the remains of the disease. The glandulæ solitariæ were here absent, and their position was indicated by vacant spots in the midst of the intestinal villi. The small and large intestine presented very numerous glandulæ solitariæ in the form of vesicles, of a grayish-white color, elevated above the surface of the pale mucous membrane, almost spherical in form, and from $\frac{3}{4}$ to 1 millimetre in diameter.[2] Those of the small intestine were without openings; those of the large intestine sometimes presented a black pigment spot, others were translucent, as if on the point of bursting, and others had an evident opening and were collapsed. Both in the small and large intestines they contained a milky liquid, coagulable by acids, which separated into a serous liquid and small spherical masses, with a granular surface from the $\frac{1}{120}$ to the $\frac{1}{125}$ of a millimetre in diameter, and not entirely soluble in acetic acid. The stomach had not been perforated by contact with the contents with which it was filled for 26 hours, but the mucous membrane of the cardiac extremity was softened.

Case V. The left lung contained, at the apex, a few tubercles, certainly not more than ten in number, which were not softened. The lungs with slight adhesions to the costal pleura. The right ventricle of the heart invested with a layer of fat, in many places 10 millimetres thick. Liver straw-colored, fatty, the fat being exterior to the hepatic cells. The difference in the weight of the lungs of this individual and those of the executed criminals is explained by the loss of blood in the latter—the result of the execution. This individual also was given to drunkenness, and, therefore, cannot be considered as in a normal condition.

The following tables relate to diseases of the heart, kidneys, and liver, and to the cholera. Researches of this kind must lead to important laws or results, for one is readily convinced, from a single glance at the tables, that, between the abnormal increase and decrease in size of the organs, these vary in the normal condition within certain limits, beyond which they do not go. Already, from the few investigations of this kind which have been made, an average is presented indicating the most frequent variations of disease.

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[1] Typhoid, or enteric fever.—Tr.

[2] At a later period, I have had an opportunity of examining two other executed criminals, in whom I found the glandulæ Peyeri and solitariæ so much developed that they appeared to be in the first stage of typhus;* but, instead of being filled with a dry, firm exudation, as in the latter disease, they contained a milky liquid. The glands in the small intestine were equally well developed in both individuals, but, in the large intestine, they were much larger and more numerous in one than the other. This appearance of the intestinal canal, strewed with thousands of vesicles (glandulæ solitariæ), is, as a normal condition, quite as constant in chylification, like the swelling of the Malpighian corpuscles of the spleen, and, in giving an opinion upon *post-mortem* examination—as, for instance, in cholera—should not be forgotten.

* Enteric fever.—Tr.

TABLE II.

MEASUREMENTS OF THE ORGANS IN DISEASES OF THE HEART.

Maximum weight of the heart, 750 grammes; minimum weight, 150 grammes.

Case	I. Obs. 6.	II. Obs. 7.	III. Obs. 8.	IV. Obs. 9.	V. Obs. 10.	VI. Obs. 11.	VII. Obs. 12.	VIII. Obs. 13.	IX. Obs. 14.	X. Obs. 15.	XI. Obs. 16.	XII. Obs. 17.	XIII. Obs. 18.	XIV. Obs. 19.	XV. Obs. 20.	XVI. Obs. 21.	XVII. Obs. 22.	XVIII. Obs. 23.
Age	28 yrs.	47 yrs.	50 yrs.	16 yrs.	35 yrs.	37 yrs.	42 yrs.	42 yrs.	61 yrs.	50 yrs.	70 yrs.	72 yrs.	70 yrs.	63 yrs.	38 yrs.	67 yrs.	35 yrs.	44 yrs.
Sex	Girl.	Woman.	Woman.	Boy.	Man.	Man.	Man.	Man.	Man.	Man.	Man.	Man.	Man.	Man.	Woman.	Woman.	Man.	Man.
Height	1,m430	1,550	1,650	—	—	1,680	1,620	1,650	1,620	1,620	1,700	1,520	1,500	—	1,520	1,480	—	—
Weight of heart	450 gr.	350	500	400	750	450	330	700	450	500	420	500	150	688,37	—	400	700	700
Length of ventricular portion	0,m110	0,140	0,120	0,110	0,150	0,120	—	—	0,140	0,120	0,120	0,120	0,080	0,110	0,100	0,130	0,180	0,135
Breadth of right ventricle	0,m040	0,040	0,056	—	0,150	0,110	—	0,080	0,070	0,100	0,054	—	68	—	—	—	0,140	0,065
Breadth of left ventricle	0,090	0,060	0,095	—		0,050	—	0,070	0,070	0,056	0,042	—		0,100	—	0,120	—	0,100
Circumference of heart near its base	—	0,240	0,320	0,224	—	0,300	—	0,340	0,280	0,300	0,280	0,240	—	—	0,230	—	0,310	—
Circumference of heart at its middle	—	0,230	0,300	0,200	—	0,280	—	0,350	0,275	0,320	0,300	0,230	—	0,300	—	—	0,300	—
Circumference of heart near its apex	—	0,180	0,220	0,150	—	0,200	—	0,250	0,200	0,280	—	0,190	—	—	—	—	0,200	—
Inner circumference of the aortic orifice	—	0,064	0,090	0,058	0,130	0,070	0,080	0,064	0,060	0,080	—	0,110 ext. cir. 0,110 idem.	—	—	—	—	—	—
Diameter of the aorta	—	0,040	0,040	—	—	—	—	0,040	—	0,041	0,050	—	—	—	0,032	—	—	0,035
Inner circumference of the orifice of the pulmonary artery	—	0,090	0,080	0,065	0,090	0,080	0,090	0,100	0,090	0,100	—	0,110	—	—	0,034	—	—	—
Diameter of the pulmonary artery	—	—	—	—	—	—	—	0,040	—	0,046	0,040	—	—	—	—	—	—	0,035
Thickness of the parietes of the left ventricle with the musculi papillares	0,032	0,028	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0,040
Thickness of the parietes of the left ventricle without the latter	0,015	0,022	0,018	0,018	0,021	0,018	—	0,020	0,020	0,022	0,013	0,022	0,011	0,036	—	0,016	0,018	0,022
Breadth of the mitral valve	—	0,032	0,030	l. lobe. 0,010 r. 0,020	0,032	0,032	0,030	0,030	0,030	0,035	—	0,032	—	—	0,019	—	—	—
Breadth of the tricuspid valve	—	0,032	0,030	0,020	—	—	—	0,028	0,030	0,030	—	—	—	—	—	—	—	—
Inner circumference of the right ventricle	—	0,210	0,200	0,120	0,190	0,140	—	0,200	—	0,250	—	—	—	—	0,160	0,128	—	0,170
Inner circumference of the left ventricle	—	0,100	0,160	0,090	0,230	0,130	—	0,125	—	0,130	—	—	—	—	0,090	0,190	—	0,170
Inner circumference of the right auriculo-ventricular orifice	—	0,232	0,100	—	—	0,100	—	0,060	0,112	0,180	—	0,100	—	—	0,082	—	—	—
Inner circumference of the left auriculo-ventricular orifice	—	0,200	0,080	0,080	—	0,090	—	0,040	0,090	0,130	—	0,100	—	—	0,033	—	—	—
Thickness of the wall of the right ventricle	0,006	0,10	0,011	0,006	0,010	0,012	0,006	0,012	0,012	0,007	0,008	0,006	0,004	0,008	0,005	0,007	0,006	0,014
Inner circumference of the right auricle	—	—	0,250	—	—	—	—	0,300	—	—	—	—	—	—	0,185	—	—	—
Inner circumference of the left auricle	—	—	0,210	—	—	—	—	0,200	—	—	—	—	—	—	0,175	—	—	—
Thickness of the wall of the left auricle	—	—	0,004	0,004	—	0,004	—	0,004	0,004	—	—	—	—	—	—	—	—	0,006
Thickness of the wall of the right auricle	—	—	0,003	0,001	—	0,001	—	0,005	0,001	—	—	—	—	—	—	—	—	0,002
Thickness of the septum ventriculorum	—	0,022	0,022	—	—	—	—	0,021	0,020	—	—	0,018	—	—	0,011	—	—	0,030
Breadth of the aortic valves	—	0,020	0,030	0,011	0,023	—	0,015	0,020	0,020	0,015	—	—	—	—	—	—	—	—
Breadth of the valves of the pulmonary artery	—	—	0,030	0,020	—	—	—	0,022	—	—	—	—	—	—	—	—	—	—
Weight of liver	1400	2450	2650	—	1700	—	1250	1650	1250	1650	1300	1150	900	—	—	—	—	1725
Weight of kidneys	each 70	r. 200 l. 220	r. 250	—	r. 140 l. 180	—	—	both 400	r. 150 l. 100	—	—	—	r. 150	—	—	—	—	r. 80 l. 100
Weight of spleen	200	210	300	—	180	—	—	300	150	—	—	150	—	—	—	—	—	295

OBSERVATIONS TO THE TABLE UPON DISEASES OF THE HEART.

OBSERVATION 6.—Pericarditis. Hypertrophy of the heart. Atrophy of the kidneys resulting from interlobular inflammation. Cysts.

A maid-servant—aged 28 years—was seized, a year ago, after rapid running, with a violent pain in the left side, which disappeared after bloodletting; but strong palpitations of the heart remained. The menstruation was suppressed. Œdema. Ascites. Albuminous urine. Hunger, but no digestion. Orthopnœa. Percussion indicated a considerable hypertrophy of the heart. The impulse of the latter did not raise the stethoscope, was weak, and not audible at a distance. Both tones were replaced by a plainly audible rasp-like sound in the vicinity of the fifth to the sixth ribs, and over the lower half of the sternum. Pulse small. The patient was visited on the 24th of Jan. 1849. Death 24th Feb. Autopsy 26th.

In the pleural cavities there was a small quantity of water. Both lungs flesh-colored, almost void of air, but readily inflated; the right one lightly adherent to the costal pleura by its whole surface. Pericardium 1 millimetre thick, hanging loosely on the heart, containing no liquid exudation. Its free and adherent surfaces covered with needle-like, fibrinous, unorganized vegetations. Beneath the latter was a vascular pseudo-membrane, consisting of fusiform fibres. The muscular structure of the heart was yellowish-gray, and soft, but contained no exudation between the muscular fibres.[1] The right and left auriculo-ventricular valves somewhat attenuated, and one lobe of the mitral valve a third shorter than the other. The semilunar valves normal, except an atheromatous spot upon one of those of the aorta. The limpid urine contained within the bladder strongly albuminous. The kidneys, with but little blood at their surface, covered with numerous yellowish-white, slightly hard granulations, from $\frac{1}{4}$ to $\frac{1}{3}$ of a millimetre in diameter, which, by incision, allowed a whitish liquid to escape. These consisted of tubuli uriniferi, invested with their epithelia, most of which contained no fat. The granulations were, therefore, not an abnormal product, but the intervening substance was very much altered. Neither bloodvessels nor Malpighian corpuscles were visible, but were replaced by elongated, nuclear, and fusiform fibres of organized exudation. The tubuli uriniferi here were also not to be distinguished. This form of renal disease may be compared to the interlobular inflammation of the liver. In the broad ligaments of the uterus, there were some pedunculated cysts, containing a clear serous liquid.

OBSERVATION 7.—Anasarca. Little water in the peritoneal cavity. Simple emphysema of the lungs, which had slight adhesions to the ribs.

OBSERVATION 8.—The valves of the heart a little thickened. Liver very fat and very much enlarged. General dropsy of the thorax, abdomen, and cellular tissue, without albuminous urine.

OBSERVATION 9.—Pericarditis adhesiva. Vegetations, and insufficiency of the mitral and aortic valves. Œdema. Ascites. Catarrh of the kidneys. Pneumonia.

A boy—aged 16 years—from sudden fright, was seized with strong palpitation of the heart, which, after treatment, disappeared. Some weeks before his death, it returned violently from anger. I saw him on the 21st of January. Face injected; pulse quick, weak; impulse of the heart very visible, but weak. Both sounds could not be discriminated. Respiration at the apex of the lungs tubular. Œdema, without albuminous urine. Death on the 22d of January. Autopsy on the 23d.

Red hepatization of both lobes of the left lung. The lower lobe of the right lung collapsed from pleuritic effusion; the apex of the lung simply emphysematous. The entire surface of the heart had contracted adhesion to the pericardium by areolar tissue not yet perfectly formed, as the fibres had a rough outline, and were furnished with nuclei. The muscular structure of the heart was red and healthy. The left ventricle was hypertrophied. The lobes of the mitral valve had an unequal length; at their free edge were 1 millimetre thick, and were covered with numerous small, hard, lenticular, red bodies, so that the sac-like dilatations had disappeared, and a perfect closure of the valve was rendered impossible. The bodies just mentioned were constituted of coagulated fibrine, in which some free fat granules and exudation-corpuscles were contained. They were not covered by the endocardium, but, nevertheless, appeared to originate or be rooted between its two laminæ. The free edge of the semilunar valves of the aorta were furnished with similar lenticular dentate bodies. The right side of the heart and the left auricle were healthy. Liver granular, yellowish, with much fat in its cells. Kidneys firm and dense; cortical substance reddish-yellow, marbled, whereas the medullary structure was red. The tubuli uriniferi, sometimes thickened by fibrinous exudation, contained a great multitude of nuclei the $\frac{1}{150}$ of a millimetre in diameter, which gave to the liquid pressed out of the cortical substance a clouded appearance. The tubuli uriniferi, in some instances, contained a granular precipitate of uric acid.

OBSERVATION 10.—Hypertrophy consequent upon carditis. Relative insufficiency of the aortic valves.

A man—aged 35 years—suffered from rheumatism fourteen years ago; eight years previously had a fall, since which he had violent palpitation of the heart. The sound of the latter, by percussion over a considerable space, was feeble. The hand placed below the sternum perceived a very strong purring. The first sound of the heart was replaced by a bellows sound, accompanied by a friction sound. The bellows sound was audible over all the large arteries. The second sound was short. The heart's impulse visible. Pulse increased; not intermitting. No œdema at any time, but hoarseness and some dyspnœa. All the functions normal. In this condition I found the patient on the 28th of November, 1848.

[1] The paleness of color and softening of the muscular structure of the heart is no absolute proof of carditis.

He left the hospital, but returned from an increase of dyspnœa, and died almost suddenly on the 30th of March, 1849.

Besides the hypertrophy of the heart, the aorta, at its origin, posteriorly formed a sac-like dilatation, which pressed upon the trachea and produced the hoarseness, the larynx being normal in its condition. The otherwise normal aortic valves were relatively insufficient, for, between their edges, a space from 1 to 2 millimetres remained through which water would run, poured in at the aorta. The inner surface of the latter at its commencement, for two fingers' breadth, was rough with calcareous lamellæ, but otherwise was without any coagula. The walls of the aorta, from exudation in its tunics, was from 3 to 4 millimetres thick. The musculi papillares of the left ventricle, in the middle 18 millimetres in diameter, presented interiorly a shining tendinous substance, radiating from the centre to the circumference, which was as hard as cartilage, and was composed of coagulated fibrine. Besides the latter, there were exudation-granules upon the pale muscular fasciculi of the same ventricle, but the right ventricle was normal. Hydrothorax upon the right side. The left lung pressed back by the enlarged heart.

Observation 11.—The man came into the hospital with stupor and paralysis of one side of the body. He was an habitual drunkard. On examination after death, the mitral and aortic valves were thickened with atheromatous deposits. There was also atheroma in the arteries of the brain, and also much serum under the investing layer of the arachnoid. Fatty liver. Eight months previously, he was said to have had an attack of apoplexy, of which no trace was now distinguishable in the brain.

Observation 12, *a*.—Calcification and insufficiency of the mitral and tricuspid valve.

A man, of 42 years of age, who formerly suffered from rheumatism, succumbed with general dropsy of the areolar tissue of the breast and of the abdomen. The urine had contained only a small quantity of albumen.

No alteration of the pericardium. The lobes of the mitral valve, which were thickened through a fibrinous exudation and a deposit of calcareous matter, were so grown together that the auriculo-ventricular orifice formed only a cleft about 20 millimetres long and 10 broad. Their thickness was irregular; in one place it reached to 10 millimetres. The lobes of the tricuspid valve also were thickened by a fibrinous exudation (to 3 millimetres), and so grown together that a small opening only remained; but there was no calcareous deposit. In this case, neither the right nor the left auriculo-ventricular orifice could be closed. The musculi papillares of the left ventricle were likewise infiltrated with calcareous matter, and only beneath the endocardium of the left auricle were found a few milk-white spots of fibrinous exudation. The liver exhibited a nutmeg-like appearance, consisting externally of elevated tumors, and being brownish-red internally with inordinate engorgement of the interlobular veins. The hepatic cells contained but little fat. Kidneys strongly hyperæmic. Hyperæmia also of the lungs.

As observations upon inflammation of the tricuspid valve are rare, I will give the account of a second case.

Observation 12, *b*.—Inflammation of the musculi papillares, and of the tricuspid valve.

In a woman of 50 years of age, who declared she never had suffered from rheumatism, the left ventricle was hypertrophied; the endocardium of the right was deeply reddened by imbibition, and the tricuspid valve was insufficient, which is very rarely the case. Instead of 30 millimetres, it was 20 millimetres broad, and was thickened to 1 millimetre. Its musculi papillares were condensed and marbled red with yellow, contrasted with the deep red hue of the muscular parietes of the heart. The condensation and change of color depended upon an exudation, consisting of exudation-granules mixed with larger fat globules, which enveloped the primitive muscular fibres. There were some milk-white spots beneath the endocardium. The liver presented a lobulated appearance, and, between the lobes, the veins were engorged with blood. Urinary cysts upon the kidneys, the medullary substance of which was brownish-red, and the surface was feebly granular. Urine albuminous.

Observation 14.—Chronic pleuritis. Œdema. Ascites. Fatty degeneration of the softened kidneys.

Observation 15.—General dropsy. Simple emphysema of the lungs. Atheroma in the mitral and aortic valves. Granulated fatty liver. Hyperæmia of the kidneys. Injection of the mucous membrane of the stomach and small intestine.

Observation 16.—Granular fatty liver, with numerous mulberry-like calculi in the gall-bladder. Spleen covered with a hard, cartilage-like pseudo-membrane.

Observation 17.—Liver with the surface resembling nutmegs; without fat. Pneumonia. Hydrothorax. Urinary cysts in the left kidney. Intermittent 30 years previously.

Observation 18.—Liver fatty, softened. Cancer medullaris of the stomach and the omentum majus, which, with the peritoneal covering of the intestines, were filled with hundreds of tumors, from the size of a millet-seed to that of a pea.

Simple emphysema of the lungs, of which the right was adherent by its whole surface to the pleura costalis. Uniform dilatation of the aorta throughout its entire course.

TABLE III.

DISEASES OF THE KIDNEY.

Minimum weight 35 grammes; maximum weight 250 grammes.

Case	I. Obs. 24. Stearosis.	II. Obs. 25. Stearosis.	III. Obs. 26. Atrophy after inflam.	IV. Obs. 27. Stearosis.	V. Obs. 28.	VI. Obs. 29. Stearosis.	VII. Obs. 30.	VIII. Obs. 31. Stearosis.	IX. Obs. 32.	X. Obs. 33. Atrophy and hypertr.	XI. Obs. 34. Stearosis.	XII. Obs. 35. Stearosis.
Age	40	19	28	45	33	30	19	26	53	66	61	19
Sex	Male.	Female.	Female.	Female.	—	Male.	Male.	Male.	Male.	Female.	Male.	Male.
Size	1,m600	1,390	—	1,560	—	1,580	—	—	1,600	1,420	1,600	—
Weight of right kidney	80	250	70	200	233	250	35 sic	220	120	35 sic	120	246
Weight of left kidney	80		70				200		120	230	120	—
Length of right kidney	0,m100	0,140	0,080	0,155	0,123	0,110	0,070	—	0,090	0,075	0,100	0,144
Breadth of right kidney	0,051	0,060	0,040	0,060	0,050	0,070	0,050	—	0,040	0,022	0,042	0,075
Circumference of right kidney	0,130	0,160	0,105	0,150	0,160	0,180	—	—	—	0,090	0,140	—
Thickness of the cortical substance	0,005 0,010	0,010	0,005	0,021	0,009	0,010	0,002	—	0,004	0,002	0,007	0,015
Thickness of the medullary substance	0,010	0,020	0,015	0,011	0,024	0,020	0,010	—	0,018	0,007	0,018	0,018 0,022
Length of left kidney	0,100	—	—	—	—	—	—	—	—	0,120	—	—
Breadth of left kidney	0,50	—	—	—	—	—	—	—	—	0,040	—	—
Circumference of left kidney	100	—	—	—	—	—	—	—	—	0,180	—	—
Thickness of the cortical substance	0,007 0,009	—	—	—	—	—	—	—	—	0,010	—	—
Thickness of the medullary substance	0,017	—	—	—	—	—	—	—	—	0,020	—	—
Weight of spleen	250	200	—	—	—	—	—	—	350	80	—	—
Weight of liver	1150	1700	—	—	1500	1600	—	—	2000	1200	950	—
Weight of heart	350	380	—	—	—	210	—	—	620	280	600	—
Weight of brain	—	1300	—	—	—	—	—	—	1400	1260	—	—

TABLE IV.

DISEASES OF THE LIVER.

Maximum weight 4630 grammes.

Case	I. Obs. 36. Simple hypertrophy.	II. Obs. 37. Stearosis.	III. Obs. 38. Stearosis.	IV. Obs. 39. Stearosis.	V. Obs. 40. Inflammation.
Age	50 years.	57 years.	50 years.	47 years.	64 years.
Sex	Male.	Male.	Male.[1]	Female.[2]	Female.[3]
Size	1,m600	1,600			
Weight of liver	1750 gramm.	1350	1650	2450	4630
Depth of right lobe	0,m170	0,150		0,300	
Depth of left lobe	0,150	0,190		0,200	
Length of the liver	0,240	0,232		0,252	
Circumference of right lobe	0,400	0,350	480	0,550	
Circumference of left lobe	0,310	0,370	300	0,200	
Diameter of acini	0,001—0,012	0,004		0,001	
Diameter of portal vein		0,018			
Diameter of hepatic duct		0,005			
Diameter of cystic duct		0,004			
Diameter of the ductus com. choled.		0,008			
Diameter of the vena cava ascendens	0,009	0,020			
Diameter of the hepatic artery	0,006	0,010			
Weight of spleen	300	250			
Weight of right kidney	150	300			
Weight of left kidney	150				
Weight of right lung	800	—			
Weight of left lung	1250	—			
Weight of heart	400	400			
Weight of brain	1440	1350			

OBSERVATIONS TO THE TABLES UPON THE DISEASES OF THE KIDNEYS AND LIVER.

Diseases of the Kidney.

Observation 24.—Stearosis of the kidneys. Albumen in the urine. Pneumonia. Œdema. Hydrothorax. Ascites. The kidneys were yellowish, granulated, with much fat in the tubuli uriniferi. The calices of both kidneys had the anomalous arrangement of opening into three ureters, instead of a common pelvis, which united into a common trunk an inch below the hilum renale. Much albumen in the urine. The heart softened, fatty, with atheroma of the mitral valve. Double pneumonia. A few calcified tubercles at the apex of the left lung. Weight of the right one 1000 grammes, of the left 1050 grammes. Liver not fatty. The disease continued during three and a half months, and originated suddenly after taking cold.

Observation 25.—Bright's disease, of the inflammatory form. Meningitis, with softening of the brain from pus. Insufficiency of the mitral valve. Fatty liver. Stearosis of the pancreas.

A young woman, 19 years of age, after catching cold, had been sick four months. Œdema of the extremities and much albumen in the urine. For fourteen days had symptoms of meningitis.

The surface of the brain was normal, but the lateral ventricles were filled with pus and serum. Corpora striata, thalami nervorum opticorum, and septum pellucidum very much softened. The softened portions were colored, varying normally and greenish; in the latter positions presenting accumulations of pus, and in the former, pus-corpuscles mixed with fragments of destroyed nerve-tubules. Lungs healthy. Insufficiency of the mitral valve, with soft vegetations upon its free borders. Substance of the heart normal. Mucous membrane of the stomach strongly injected, everywhere softened to liquefaction. The kidneys externally not granulated in appearance, from which the membrana propria was easily torn away. The cortical substance in section presented a yellow appearance mingled with gray, and contained small abscesses; was throughout mixed with pus and inflammation corpuscles, whilst the tubuli uriniferi contained only a few oil-globules; the Malpighian-corpuscles were bloodless, and the red medullary substance was normal.

For the first time, and so far as I can recollect nowhere mentioned, I found the following case of degeneration of the pancreas.

[1] The same case as No. X. of the Table of Diseases of the Heart.
[2] The same case as No II. of the Table of Diseases of the Heart.
[3] Parallel condition of stearosis and inflammation of the liver.

In some lobules, about twelve in number, were found milk-white spots, from one to two mil. in diameter, which contrasted remarkably with the yellowish glandular substance. The spots were but lightly elevated, and consisted of the terminal vesicles of the gland, distended with fat, in which the epithelial cells were distinct but not their nuclei. The fat formed within the vesicles a cohering milk-white mass, like an emulsion, which only formed drops after its escape.

Observation 26.—Softening of the brain. Stearosis.

Observation 27.—Endometritis purulenta. Granulations on the neck of the uterus. Pus in the Fallopian tubes. Stearosis of the kidneys. Œdema. Ascites. Hydrothorax. Albuminous urine. Œdema of the brain and lungs.

The aorta was filled with liquid blood. Liver granular, fatty. Mucous membrane of the stomach injected, at some places softened. The cortical substance of the kidneys was granulated, yellowish, and the Malpighian bodies were bloodless. The tubuli uriniferi were full of fat, without epithelia. Medullary substance red, with little fat in its tubuli. Arteria and vena renalis not closed. The inner surface of the somewhat enlarged uterus was filled with a soft caseous, not adhering mass, which consisted of pus-corpuscles, and exudation-granules. The orifice of the uterus was beset with soft granulations about the size of peas, which were connected to the lining membrane; the substance of the uterus being healthy. The granulations consisted of fusiform fibres, pus-corpuscles, and vessels. The Fallopian tubes were dilated and distended with a thick caseous pus, and their mucous membrane was velvety, and the muscular coat thickened.

Observation 28.—Œdema. Ascites.

Observation 29.—Stearosis of the kidneys. Œdema. Ascites.

Albuminous urine. Non-inflammatory engorgement of the lungs. Cortical substance of the kidneys yellowish, granulated; the tubuli and Malpighian bodies full of fat; medullary substance red. Liver fat, soft to liquefaction. Spleen so firm, that it was readily sliced into thin lamella of a red flesh color.

Observation 30.—See the history of the case in Observation 38. Pyæmia.

Observation 31.—Stearosis of the kidneys. Albuminous urine. Hydrothorax. Ascites. Œdema with gangrenous erysipelas. Œdema of the lungs.

Blood of a syrupy consistence. Kidneys yellow, smooth; the cortical substance with little blood; medullary substance red. The entire kidneys softened to liquefaction. In the calyces and pelvis of the right kidney some calculous matter. Liver fatty.

Observation 32.—General dropsy. Albuminous urine. Sudden death from apoplexy. Effusion of blood within the pons varolii, which latter yet formed a thin rind upon the coagulum. Atheroma of the dilated basilar artery. Lateral ventricles dilated with bloody serum. Kidneys anemic. Liver filled with blood, not fatty. The cortical substance had upon it hard yellowish granulations, the tubuli uriniferi were filled with a consistent, yellowish, granular substance, the Malpighian bodies were bloodless, and the medullary substance was red in color.

Observation 34.—Stearosis of the kidneys. Hydrothorax. Ascites. Œdema.

Albuminous urine. Fat in the tubuli uriniferi. Old adhesions of the pericardium. Atheroma and calcareous lamellæ in the aorta. Splenization of the lungs. Liver fatty, with a nutmeg-like appearance of the surface.

Observation 35.—Stearosis of the kidneys. Ascites. Œdema. Albuminous urine.

The cortical substance of the kidneys soft and pale, with anemic yellowish spots; medullary substance pale red; and the Malpighian bodies bloodless. Tubuli uriniferi filled with fat, but less in those of the medullary than of the cortical substance. Spleen firm, hard, red, with a deposit of fibrine, which in some places was even organized to fine fibrillæ mixed with fat granules. There were also in the spleen some gray masses, about the size of a pea, which consisted of fat.

OBSERVATIONS TO THE DISEASES OF THE LIVER.

Observation 36.—Intemperate. Cirrhosis of authors: a simple form of hypertrophy. Pneumonia.

Arachnoid thickened; lateral ventricles of the brain dilated with serum; substance of the brain tough. Right side of the heart covered with much fat. Lungs with slight adhesions to the ribs; the right hyperæmic, the left in the condition of gray hepatization. Mucous membrane of the stomach pale and softened. Spleen softened. Liver brown yellow, appearing granular on the external surface. The granulations were from 1–12 mil. in diameter; some rounded, but most of them had an elongated square basis; and a few were elliptical and somewhat pointed. The capsule of Glisson was readily torn off from them. The interspaces of the granulations were from $\frac{1}{4}$ to 1 mil. broad, and their bloodvessels were readily injected, more especially the vena portarum, which permitted the finest branches to be filled, and which contained a few blood-coagula in the larger branches only. The hepatic cells measured $\frac{1}{33}$ by $\frac{1}{50}$ mil. and contained only a few fat granules. The same granular structure was observable in the section of the liver. No abnormal deposit existed within the cells or acini in this case. Bile normal. No dropsy.

Observation 37.—Stearosis of the liver and kidneys. Hemorrhage of the lungs. Softening of the brain.

A working man, 57 years old, was engaged in his occupation to within five days of his death, which took place after some hours residence in St. John's Hospital. Autopsy, January 25, 1848.

The brain was so softened that the fingers passed into its substance with slight pressure, and the membranes were easily separable, but the arachnoid was somewhat thickened. Atheroma in the arteries of the brain. The lungs at the borders were emphysematous; the upper and middle lobes of the right one were devoid of air and softened, and when incised blood poured

out which had been extravasated into the organ. Heart covered with much fat, and in all four cavities was black blood of a syrup-like consistence. The spleen, which was double the normal size, contained the same kind of blood. The liver was granular and yellowish upon the surface and in section; the granulations were not entirely globular, but polygonal or oblong, and were projecting, and from 1 to 3 mil. high. The interspaces between them were from $\frac{1}{4}$ to $\frac{1}{2}$ mil. wide. The hepatic artery being injected with yellow size, and the vena porta with green, both passed into the interspaces of the lobuli, and rarely, the green passed into the centre of the latter. (See Plate III.) The capsule of Glisson was not thickened. The hepatic cells were filled with fat. The right lobe of the liver was less developed than the left. The cortical substance of the softened kidneys was yellowish, and their tubuli uriniferi filled with fat.

TABLE V.

CHOLERA FROM MAY 10 TO JUNE 1, 1849.

	FEMALE.				MALE.							
Case	I.	II.	III.	IV.	I.	II.	III.	IV.	V.	VI.	VII.	VIII.
Age	2 years.	6 yrs.	35 yrs.	44 yrs.	10 yrs.	31 yrs.	37 yrs.	40 yrs.	40 yrs.	46 yrs.	60 yrs.	73 yrs.
Size	0,m670	0,m870	1,m600	1,m570	1,m170	1,m690	1,m740	1,m580	1,m480	1,m700	1,m667	1,m660
Weight of brain	1230 gramm.	1250	1350	1270	1400	1475	1500	1370	1300	1480	1430	1370
Weight of lungs	160	450	580	600	350	1070	1250	670	1000	1300	900	1000
Weight of heart	50	80	220	230	150	330	normal	290	270	400	320	350
Weight of liver	290		1150	1150	1000	1850	2480	1400	1400	1450	1250	1270
Weight of right kidney	30	100	120	90	60	250	150	230	150	150	120	230
Weight of left kidney	—		130	—	—	260	150		120	150	120	
Weight of spleen	30	70	150	130	80	300	480	190	100	200	100	150
Duration of the disease	12 hours	18 hrs.	12 hrs.	16 hrs.	—	7 hrs.	several days.	12 hrs.	15 hrs.	several days.	15 hrs.	9 hrs.
Occurrence of the rigidity of death after the *post-mortem* examination	24 hours not present.	28 hrs. present.	15 hrs. present.	38 hrs. present.	—	—	15 hrs. present.	24 hrs. present.	12 hrs. present.	35 hrs. present.	13 hrs. present.	25 hrs. present.

OBSERVATIONS TO TABLE V. ON THE CHOLERA.

If we direct our attention to the pathological phenomena and truly characteristic anatomical alterations in cholera, we observe under the operation of the morbific cause the following:—

1. A retardation and final paralysis of the contractions of the heart, as also of the contractility of the large arteries.

2. A diminution in the quantity of blood exposed to the influence of atmospheric oxygen in the lungs; indicated by a decrease in weight of the latter.

3. A diminution or cessation of all secretions, probably induced by a retardation of the circulation.

4. A gradual cessation of all contractile power in the organic muscular fibres of glandular ducts. Those which convey the bile, and the gall-bladder, no longer discharge their contents; the ureters do not expel the milky liquid contained within the pelvis of the kidneys; and finally, even the intestines cease to empty themselves. A similar paralysis in variable degree is exhibited by the muscular fibres of the bronchi; and it is alone to this cause, with a reduction of the moisture of the vocal cords, that I ascribe the diminished voice and the peculiar hoarseness of the disease.

5. A decrease of the temperature; continuing parallel with the commencement of cyanosis, according to my examinations, in the hand, falls rapidly to 75° F., in the axilla to 88°.

6. If, upon the one hand, in the integrity of the brain and spinal marrow, the cramps appear only as reflex phenomena, nevertheless the sympathetic nervous system must be viewed alone, and primitively as affected by the cause of the disease.

7. The medium between the latter and its operation upon the nervous system appears to be the blood. The absence of the phenomena of coagulation, even if not always complete, indicates an alteration in the character of the blood.

8. An inoculation of the disease through the blood, or by the stomach, by means of the intestinal discharges, I have tried, in all stages, upon rabbits and frogs, without success.

9. The anatomical alterations observed by me are as follow:—[1]

The rice-water or whey-like discharges from the bowels, put in a tall glass vessel, separated into a sediment and a clear serum always albuminous. As a general rule, the sediment consisted of nuclei (mucus-corpuscles) of epithelial cells, such as fill the simple glandular follicles, but never contained perfect epithelial cells. Cryptogamic plants were never observed in it. Once only did I see infusoria (monas, navicula),[2] and rarely the filaments first noticed by Bœhm, and regarded by him as probably resulting from the transformation of epithelial cells. Evacuations by vomiting, when consisting of a ricewater-like liquid, presented the same components as the former in addition to epithelial cells of the stomach, but when greenish in color they contained but few epithelial nuclei or cells.

In all cases, the brain exhibited considerable peripheric hyperæmia, and sometimes, also, an augmentation of the sub-arachnoid fluid.

In all, too, the bronchia were distinguished by diminution and frequently absence of mucus, and the lungs were remarkably impoverished of blood, so as to produce a considerable reduction in their weight. In the normal condition, in the adult, both lungs weigh about 1200 grammes, but in cholera cases which had proved fatal in the course of a few hours, they mostly fell far short of this number. In a longer duration of the affection they again increased in weight, but never reached the normal standard.[3] Besides the anemic condition of the lungs, ecchymoses of various sizes were sometimes found either in their parenchyma or beneath the pleura. At times, also, the upper surface of the lungs appeared more inflated than usual; that is, the air-cells contained a greater quantity of air without being torn, and this condition has been indicated as emphysema, which it is not, but the result of the diminished or paralyzed contractility of the bronchi during life.

Ecchymoses were sometimes found upon the heart, and its cavities always contained a variable quantity of blood of the consistence of syrup, in more than half the number of cases coagulated; but the coagulum was usually in small quantity. The fibrine of the latter sometimes included a remarkable quantity of lymph-corpuscles, or spherical milk-white globules, covered with minute granules, but in other cases these did not exist.

The endocardium generally was normal, and rarely of a clouded blood-red hue.

The aorta and principal venous trunks usually contained a liquid syrup-like blood. The blood-corpuscles were normal, and retained this appearance for several days after *post-mortem* examination.

The stomach commonly contained a ricewater-like liquid, sometimes in small quantity, and ordinarily colored, more or less albuminous, and usually consisting of serum and epithelial fragments. Frequently, there was a considerable accumulation of gas.

The gastric mucous membrane was pale, and presented ecchymoses in the *cul-de-sac*, but was not softened.

The contents of the small intestine were commonly milk-white, or of a clear gray color, and very rarely yellowish or reddish, and consisted of a serous liquid and a sediment composed of the exfoliated cylindrical epithelia of the mucous membrane and its villi.

Sometimes the intestinal mucous membrane was strongly injected, and the villi throughout its entire extent were always deprived of the epithelium, but the follicles of Lieberkühn only partially.

The glands of Brunner, the solitary glands, and plaques of Peyer, frequently were swollen with their

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[1] The preceding table, with short notes appended upon the *post-mortem* appearances, was originally published in the *Mém. de l'Acad. des Sciences* de Bruxelles, and is here reproduced with some additions.

[2] The monas, even in myriads of millions, is entirely harmless as a parasite, and the navicula, also harmless, did not belong to the intestinal canal, but most probably was taken in the drink of the patient.—TRANS.

[3] The weight of the lungs in cholera approaches that observed in beheaded criminals.

natural milky liquid,[1] and it is worthy of remark that although this tumefaction sometimes did not exist in those who died within twenty-four hours from the commencement of the disease, yet, generally, it was absent only in such as had been longer ill. The tumefaction of the glands was absent in five cases out of eleven. Sometimes the isolated glands were bursted, and then exhibited a distinct central opening, and when those of the plaques of Peyer were bursted, the latter presented a reticulated appearance. I view the tumefaction of these glandulæ as the result of retention induced by the disease, of the normal liquid which is produced in chylification. In typhoid, a dry exudation is deposited in the glandulæ, consisting of well-known nuclear structures.

The contents likewise of the large intestine consists of a ricewater-like liquid composed of a strongly albuminous serum, and a sediment, in which, however, epithelial cells are scarcely any longer visible. The mucous membrane is mostly pale, and the epithelium only partially exfoliated.

The serous investment of the intestinal canal was sometimes injected, and at others pale. The mesenteric glands were sometimes yellowish, of the size of a hazel-nut, tumefied, and infiltrated with an albuminous liquid.

The liver contained blood only in its large venous trunks, and in the first victims of the epidemic—drunkards and scrofulous children—was fatty, but this condition was rather the result of former disease.

The gall-bladder was filled with black albuminous bile, and the biliary ducts with epithelia without bile. The spleen was generally soft.

The kidneys contained liquid blood in their venous trunks, and sometimes exhibited ecchymoses upon their surface.

The calyces and pelvis were filled with a milky liquid consisting of serum and epithelial cells, and a similar fluid containing the separated epithelia of the tubuli uriniferi was compressible from the papillæ renales.

The cortical substance sometimes was anemic, at others vascular.

The bladder, mostly contracted, contained a small quantity of turbid liquid, rendered so by flocculi of epithelium from the mucous membrane, which was ecchymosed.

Sometimes no albumen was detected in the urine, at others a small quantity, but rarely in that contained within the bladder.

No opportunity was presented to me to examine cholera cases in which cavities existed in the lungs, although persons in such a condition died in this place. In a few instances only did I find tubercles in the mesenteric glands.[2] Some pregnant women also died of cholera, but of these I have indicated no case in the table.

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[1] The same appearances I have observed in executed criminals who were healthy.

[2] Phthisical patients are not exempt from cholera, although most observers remark the small number or even absence of such among the first victims of an epidemic; but it can be readily understood that so soon as the disease becomes more prevalent, tuberculous cases will be found among them.

HISTOLOGY.

HISTOLOGY.

INTRODUCTORY REMARKS.

Pathological Histology comprises the description of abnormal tissues, their individual elements,[1] and their development.

Tissues produced under the influence of disease are composed of physical elements, in which the inorganic or organic constituents predominate. The former consists of amorphous or granular matter, or crystals; the latter of fibrine and albumen, or fat.

As the first class of pathological deposits are mixed with inorganic elements, ordinarily with one and frequently, also, in small quantity, these are necessarily combined with organic elements in various relations. Their existence appears essential if the organic elements are to assume a definite form, and if we knew exactly what quantity and quality of inorganic substances were requisite to the formation of each tissue, a new field would be open to therapeutics. Thus, upon the supposed necessity of phosphate of lime in the formation of cells, a therapeutic treatment has already been established.

Among all organic substances, fibrine alone appears to me to be capable of immediate organization or conversion into tissues, and then only in combination with albumen and fat. Hence, it may be placed down as a principle, that organization never commences without the presence of fat, separated into the form of globules, which contributes with fibrine, to the formation of the various tissues.

Albumen, to become organized, probably, must first be converted into fibrine. This view, however, although resting upon the fact of the transformation of the latter into tissues in pseudo-membranes, yet the mode is entirely unknown in which albumen becomes solid in the process of nutrition. Under these circumstances, I shall prefer employing the expression plastic or coagulable liquid or proteine in speaking of the formation of tissues, thus leaving the question open as to the participation of fibrine and albumen in the process. It is nevertheless remarkable, that in the strongly albuminous liquid of a blister, at first no molecules or nuclei are visible, nor when this liquid is removed do they form; but later, if the stasis continues and fibrine exudes, they begin to appear.

In disease, as in the normal processes of nutrition, the coagulable or plastic liquid convertible into tissues, is mostly derived from the blood.

This development of tissues occurs most frequently in the proteine substance which has exosmosed from the bloodvessels, but it may also take place, though in a limited degree, in the entire mass of blood discharged when the latter are lacerated or in the blood within the vessels themselves.

Chyle and lymph; the former, the main source of the formation of the blood; the latter being the result of the imbibition of the effete elements of the tissues, are capable only of an inferior and rare metamorphosis into the elements of tissues. The only instance which I, at present, can admit, is their conversion into nuclei or nucleus-like structures in the form of tubercle and pus, which have been observed within the

[1] The elements of the tissues, are their individual parts; thus the cells are the elements of the epidermal tissues, fibres of fibrous tissues, etc. The association of several tissues forms an organ.

lacteals and lymphatics. Probably, also, the nuclei of medullary carcinoma (medullary cancer globules), may be reckoned in this category.

Pathological formations are either perfect tissues homologous to those which are normal, or they are tissues arrested in some stage of their development. The former intimately associate themselves with the natural tissues and organs, determining hypertrophy, or they occur in these as isolated masses constituting tumors. These tissues undergo the same metamorphosis as in the normal development of the embryo.

The latter class of pathological formations are histological malformations, and resemble the malformations of organs, the history of which lost its marvellousness so soon as their normal course of development became known.

To decide how far these pathological productions exercise an injurious influence upon the organism, or how far they are compatible or incompatible with life, is no more the business of histology, than it is for the chemist to consider the influence of different substances upon the living body when engaged in their classification. If we were more intimately acquainted with the chemical and organic relations of pathological tissues, such an independent scientific treatise would exert quite as great an influence upon pathology as does theoretical upon practical chemistry. Nevertheless, the practical utility of histology is sufficiently great at the present time, avoiding all disposition to over-estimate the subject, to command the close attention of the practical physician.

FIRST SECTION.

DEVELOPMENT OF THE ELEMENTS OF TISSUES.

§ 1. ELEMENTS OF TISSUES.

THE pathological formations are as follow:—

1. Perfect physiological tissues (homologous formations).

2. Imperfect tissue elements or heterologous formations, to which belong:—

a. Granular or amorphous proteine substance or cytoblastema.

b. Fat-globules.

c. Nucleoli or elementary granules, consisting of fat or proteine, or a combination of both, or of pigment, isolated or in a mulberry form (inflammation-globules), and united into irregular groups.

d. Nuclei.

e. Cells.

f. Fibres having a quadruple mode of origin, viz.: fibres more or less defined, formed by cleavage (cleavage-fibres), as, for instance, such as occur in exuded coagulated fibrine;[1] fibres formed through coagulation (fibres of coagulation) in a gelatinoid blastema, as, for instance, sometimes occurs in colloid; fibres proceeding from cells (cell-fibres); and fibres produced by the deposit of extended layers around nuclei, or by the prolongation of these (nuclear fibres).[2]

§ 2. DEVELOPMENT OF CELLS IN THE EXUDED PLASMA OF CAPILLARY VESSELS.

First Mode of Cell-Formation.

The coagulable liquid which exudes from the bloodvessels is called cytoblastema, and in it are formed the above-mentioned elements of the tissues in the following manner:—

At first nuclei originate, which are spheroid, oval, or pointed at two extremities, sometimes clavate, from one of the latter being rounded. They are of very variable diameter, are soluble in caustic potassa, but ordinarily not in acetic acid. The majority, but not all, contain several—usually 2 to 4, rarely more—shining granules, resembling fat-globules, from the $\frac{1}{800}$ to the $\frac{1}{500}$ of a millimetre in diameter. These latter are the nucleoli, and they probably precede the nuclei in their origin, for I have frequently observed them as the first visible form in exuded cytoblastema, but have not seen their relative course of origin directly.

In the formation of pus-corpuscles, the so-called nuclei of which I view as nucleoli, this appears most distinctly to be the case, for the latter appear in the plastic liquid shortly before the occurrence of the pus-

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[1] Schwann has indicated examples of fibres which he could not trace as originating in cells, as in the cartilages of the ribs, in the last transformation of the chorda dorsalis, and in the formation of feathers. From a verbal communication, I am informed he does not view fibres as necessarily produced from cells, but may be formed by a cleavage of the substance in which they exist, constituting cleavage-fibres and cleavage-structures, in an analogous manner, as in inorganic nature; besides crystals, determinate forms occur, as, for instance, in the formation of the basaltic columns, evidently from a previously liquid mass, or in the cleavage of slates, or the formation of asbestos, etc. This admission, however, Schwann considers does not by any means affect the general laws of the development of tissues of which the organic cell remains the fundamental type.

[2] Frequently, the simple nuclear fibres become fused together at their extremities, and form in this manner longer and knotted fibres.

corpuscles. A like instance is presented in the formation of epithelial nuclei (mucus-corpuscles) in the mucus of catarrh. At a later period, the nucleoli become blended with the nucleus, and then are no longer visible; thus this appears distinctly to be the case in the formation of epithelial cells upon blistered surfaces.

At the next step of cell-formation around the nucleus, a layer of matter accumulates, soluble in acetic acid, at least always in the beginning, the outer part of which is converted into a cell-wall, while the inner portion constitutes the cell contents inclosing the nucleus. The latter, not unfrequently several in number, generally lies eccentrically within the cell, but sometimes in the centre.

Frequently, new nuclei form in cells, which previously have but one, and around them new cells. In many cases, the cell-wall forms only a half circuit, or partial layer, around the nucleus, or, as observed by Schleiden to be the case in plants, the cell-wall lies upon the nucleus in the relative position of a watch-crystal to its dial.

Cells appear rarely to increase by division in the animal, as is so commonly the case in cryptogamous plants, and an undoubted instance I have not observed, but have only sometimes seen the beginning of the process.[1]

The cells are spherical, ovoid, flattened, or polyhedral from mutual pressure, or sometimes have filiform prolongations, which are frequently split up into more delicate filaments. The cell-wall closely surrounds the nucleus, or is separated from it by a layer of softer, granular, or amorphous semi-liquid contents, which may be constantly increased by endosmosis. The latter is rendered evident when cells are treated with water, when they are observed to dilate and then burst.

The formation of a nucleus is not an essential condition to the production of cells, for there are instances in which the latter occur without having been preceded by a nucleus. All non-nucleated cells, however, do not belong to this category, for frequently a nucleus originally exists, but afterwards becomes indistinct, or disappears entirely, by solution in the cell-contents. Cells may form even after the exuded plasma is separated from the body. This may be observed with certainty in the fluid of a blister. There is, however, nothing very remarkable in the fact, for we observe, under the influence of the warmth of incubation, entire organs formed from the organizable liquid of the germinal vesicle in the egg of birds.

Second Mode of Cell-Formation.

Small bodies appear, ordinarily, spherical and resembling fat-granules, to which, in fact, they often correspond in their relations, but also frequently may consist of proteine or sometimes of pigment. These average in size from the $\frac{1}{500}$ to the $\frac{1}{400}$ of a millimetre in diameter, and become associated, in groups of from 10 to 40 or more, by means of a coagulated albuminous matter soluble in acetic acid. The groups of granules are mulberry-like globules, measuring on the average the $\frac{1}{30}$ of a millimetre, and in this condition are frequently observed. Only at a later period does a cell-membrane rise upon these globules, occurring by the separation of an exterior soft layer resembling coagulated albumen, and, in the mean time, the granules within gradually disappear by liquefaction. This, however, only occurs when the contents consist of proteine or fat, and then, ordinarily, a nucleus, rarely more, becomes visible, which appears as if it had been previously formed. This is a peculiar mode of cell-formation, in which nucleoli are formed in large quantity (the first layer), from which a simple or compound nucleus is produced. So long as this structure remains without a cell-membrane, I have given it the name of inflammation-corpuscle,[2] which should be retained, because other adopted names—granular cells (originating in a false hypothesis), or granulated bodies—are inadequate, whereas

[1] That cells do increase by division, in the animal body, appears evident in the development of the groups of cells in articular cartilage.—TRANS.

[2] Exudation-corpuscle of most authors.—TRANS.

the former appears most expressive, as the inflammation-corpuscle is the first characteristic form produced wherever blood stagnates and becomes organized after or without exudation, or, in other words, wherever inflammation occurs. It has been very learnedly shown that similar bodies appear in the colostrum and in the egg; but I have in no case asserted that they are found only in inflammation, and, on the contrary, I have ever tried to harmonize the pathological alterations of organs as much as possible with physiological development, for I have always viewed disease as nothing more than a physiological process modified by accidental causes.

§ 3. PARALLELISM EXISTING BETWEEN THE PATHOLOGICAL AND PHYSIOLOGICAL DEVELOPMENT OF CELLS BY THE FIRST MODE.

If we examine the development of physiological tissues, we find, according to Schwann, they originate from cells in the following manner:—

In the beginning, in an amorphous or finely granular cytoblastema, there originate non-nucleated cells—or nuclei—or the commencement of these, around which, at a later period, the cell is formed. Non-nucleated cells occur in low plants, but, according to Schwann, rarely in animals. The young cells of the chorda dorsalis, of the yolk of the egg of the bird, of the mucous layer of the germinal membrane, and some of those of the crystalline lens, belong to this category. (Schwann, p. 204.[1])

Non-nucleated cells, also, are rare, as we have seen above, in pathological tissues.

Most of the tissues of the body of mammalia originate in nucleated cells, and the nucleus is either solid or hollow. Such is also the case in pathological tissues.

The nucleus generally contains one or two small dark nucleoli, more rarely three or four. The same is the case in pathological nuclei, in which the nucleoli are also occasionally absent.

Most nuclei are not dissolved by acetic acid, at least not rapidly. (Schwann, p. 206.) This is found likewise to be the relation of pathological nuclei. Pus-corpuscles, however, which I view as nuclei, quickly dissolve in acetic acid, leaving behind the nucleolus; but many other nuclei do not dissolve at all, or do so only very slowly, as the so-called mucus-corpuscles, or nuclei of epithelial cells.

The nuclei of animal tissues appear to be developed from nucleoli, as, according to Schleiden, is the case in plants. I have not been able directly to observe such a development of pathological nuclei, but it often appears to be the most probable mode.

Cells exhibit a variable constitution. Thus, according to Schleiden, the cell-membrane of the youngest cells of plants dissolves in water, but not at a later period. The cell-membrane of cartilage-cells is soluble in acetic acid, that of the blood-corpuscles is not; the young epithelial cell-wall is also soluble in the latter liquid, but no longer after it has become corneous; etc. Whilst the wall of most cells is dissolved by a solution of caustic potassa, epidermal cells only become clearer and swell out. Similar phenomena are presented by the cells of pathological structures. Ordinarily, these cells at the commencement of their development dissolve in acetic acid, but at a later period do so no longer, as in the case of abnormal epithelial cells.

Cells grow by endosmosis, and through deposition upon the inner surface of their membrane. In plants the deposits frequently occur in layers. Pathological cells also grow by endosmosis and deposit upon their inner surface. Concentric deposits rarely take place in the latter, so that the layers remain distinct (as in cancer, Fig. 11, *b*, Pl. VI.); and occasionally these deposits occur externally, and afterwards become transformed into fibres. Similar results of physiological development I have observed in the skin.

In some cases a fusion takes place between the cell-wall and an intercellular substance or of the walls of neighboring cells, as, for instance, in certain cartilages. (Schwann, p. 217.) A similar occurrence I have

[1] Mikroskopische Untersuchungen über die Uebereinstimmung in der Struktur und dem Wachstum der Thiere und Pflanzen. Berlin, 1839.

observed, though rarely, in the epidermal formations of meliceris, in which the walls of the sac and the cavity became indistinct; and only the outlines of the contained cells remained visible, in the form of a shaded network. (Fig. 10, Pl. II.)

The endogenous reproduction of cells occurs rarely in animals, as in cartilage, and in the thyroid gland, but is common in plants, and is frequent in pathological products, as in cancer, and not rarely in abnormal epithelial formation (catarrh of the bladder). An extraordinary enlargement of parent and secondary cells is presented in the endogenous formation of cysts. It is a repetition of the process of endogenous cell-production on a grand scale. In these cases, there is at first formed a scarcely visible, semi-solid, rounded, gelatinoid mass, the nucleus, and around this a layer becomes separated which is the cell-membrane. The new cell grows by endosmosis, and finally is supplied by bloodvessels, and through these material for a repetition of the same process. New cells produced within the former, originally are eccentric and attached to the wall of the parent cell, but afterwards separate and pass towards the centre of the latter, so as to give place to new formations. In this manner several generations of cysts, that is to say, cells within the parent cyst (cell) may be produced. The origin of cysts in organs, in which they do not exist normally, without doubt frequently occurs through the enlargement of an ordinary cell.

Cells produced in diseases exhibit throughout a like relation to those, the result of physiological development. As we have seen, they grow by imbibition and deposit upon the inner surface of their membrane, and exchange or convert chemically their contents. The latter fact is particularly striking in the case of adipose cells of many fatty tumors, which, after having existed some time, are found to contain albumen or fibrine; also in the cells inclosing blood-corpuscles, which afterwards become converted into pigment; and again in the calcification of cells. On the other hand, cells containing albumen often become filled with fat-globules or with pigment.

Besides the faculty of imbibition and growth possessed by cells, which, according to the ingenious comparison of Schwann, might be considered as crystals formed of organic materials endowed with the capacity of imbibition, they have no other vital property. Movement or contraction in cells is observed quite as little in those produced pathologically as in such as are physiological. On the contrary, nuclei as well as cells have a marked degree of influence upon the production of new cells in the plastic liquid which contains them, as in the case of pus-corpuscles and the cells in cancer.[1]

§ 4. ARTIFICIAL FORMATION OF CELLS.

The artificial production of cells from the contact of oil with albumen, as discovered by Ascherson, has often been compared with that which takes place in the living body. Such cells, however, although composed upon the principle of formation by layers (a layer of albumen surrounding a globule of fat), are as different from those produced through the vital agency, as a corpse is from a living body. This difference is strikingly observed in cases in which such a mode of cell-formation as the former occurs in the living body. In the tubuli uriniferi, for instance, precipitates are sometimes produced consisting of fat-globules surrounded by albumen. These artificial cells are non-nucleated and undergo no kind of transformation.

A not uninteresting modification of the fact, discovered by Ascherson, I have observed when nitric

[1] Unfortunately the conditions of this influence are unknown, but they appear to depend upon accidental causes and the nature of the cytoblastema. Thus fermentation is induced in a solution of sugar, by the addition of yeast, but the ferment-corpuscles disappear. If, however, the yeast be mingled with a vegetable juice containing gluten, the former reproduces itself from the latter. Again, the products of fermentation differ when yeast or when rennet is added to a solution of sugar. These observations have no other object than to show that what exercises an influence upon the production of the various forms of tissues, are causes certainly accessible to the naturalist, and not hypothetical vital powers.

acid is added to bile containing albumen. A precipitate of resinous molecules takes place, around which a layer of albumen is deposited. This phenomenon I have noticed most satisfactorily in the albuminous bile of cholera cases.

§ 5. PARALLELISM EXISTING BETWEEN THE PHYSIOLOGICAL AND PATHOLOGICAL DEVELOPMENT OF CELLS BY THE SECOND MODE.

Inflammation-corpuscles belong to the second mode of cell-development, and, however frequently they are asserted to result from the transformation of cells, the contents of which at first were not granular, or are to be viewed as the remains of cells,[1] no unbiased observer will deny they find their analogy in the originally non-cellular development of the cleaving globules of the fecundated ovum, or even in the development of the egg itself, which is at first observed in the ovary of the bird as a mulberry-formed agglomeration of globules, in which, only at a later period, a central spot and a hollow nucleus, or the future germinal vesicle, becomes visible. Even in the fully-developed germinal vesicle, as in that of the frog, masses of globules, resembling inflammation-corpuscles are observed, which, only at a later moment, become enveloped by a cell-membrane. (Compare the observations of Nägeli, Kölliker, and Vogt, and those in opposition by Reichert.)

§ 6. DEVELOPMENT OF FIBRES.

In the enumeration of the tissue elements, the different forms of fibres which occur in morbid tissues have already been mentioned. Nuclear fibres originate by the elongation of nuclei at one or both ends, and the deposit of layers upon these, so that the nucleus is the central point around which, to the greatest extent in the direction of the long axis, a new layer, the fibre, is deposited. Cell-fibres, in the same manner, originate from cells. Whether fibres ever form by the conjunction with one another of nuclei I have never distinctly observed, and such a mode of origin is in my mind doubtful. By far the greatest part of fibres in pathological structures originate from cleavage of a coagulated plasma, as is frequently the case in pseudo-membranes and fibrous polypi of the uterus, or through coagulation in a liquid plasma. Generally in these cases, and always in young fibres, minute fat-molecules are observed upon their surface. Many fibres of pathological formations remain in the embryonic condition without further development; they continue as cell, nucleus, or cleavage-fibres, without ever constructing a regular tissue.

§ 7. CONCLUSION.

If we adhere to the general conception of the cell theory, and particularly to the beautiful parallel drawn by Schwann between crystallization and the formation of fibres—the similarities and dissimilarities of which he has explained—and remember the opinion frequently expressed by him that, to constitute a cell, a cavity is unnecessary, but that the formation by layers, ordinarily of two different substances, is the most important character, it must be acknowledged that the physiological formation of cells by the first mode, as conceived by Schwann,[2] is the same as that which is pathological. It is, however,

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[1] How can such structures be regarded as the disintegrating remains of cells, when it is observed they appear in the most healthful animals within the veins of the lungs, in the course of 24 hours, when quicksilver is injected?

[2] "The whole process of the construction of a cell, therefore, consists in the primary origin of a minute corpuscle, the nucleolus, around which is deposited a layer constituting the nucleus; and then, later, a second layer, the cell-substance or contents. The different layers grow by the reception of new molecules among those already existing by intussusception, and a law determines the deposition more strongly in the external than the internal part of each layer, and more so in the most exterior layer than in those within. Under the operation of this law, frequently only the external portion of each layer becomes condensed to a membrane (the membrane of the nucleus and that of the cell), and the exterior layer is more perfectly developed than that of the nucleus."—Schwann, p. 213. Hence, the formation of the cell is a repetition of the production of the nucleus.

to be regretted that Schwann, perhaps for the purpose of drawing the parallel between vegetable and animal tissues, was sometimes obliged to employ the term cell for structures which are not such; for a solid body, or one having no cavity, is no cell.[1]

As regards pathological tissues not consisting of cells, their immediate development from the latter, as we have above seen in the case of solid fibres, is still more to be restricted than has been done by Schwann (page 22). So far as my observations extend, and they are numerous in the development of abnormal tissues, I am not prepared to assert, with Schwann, that, to form a muscular fibre, a nerve-tubule, or a blood-corpuscle, cells must first originate, out of which they are immediately developed. Several tissues in pathological structures, such as the striated muscular fibres, or even the nerve-fibres, are observed with very great difficulty in their course of development; but others, as bloodvessels and the Haversian canals of bone, I am satisfied are not necessarily, and in all cases, developed from cells.

Cells appear to assume the part of a chemical apparatus, in which the materials of the tissues are prepared, and they either become immediately converted into the latter—as cartilage cells into bone-corpuscles and bone laminæ, or fibres; epidermal cells into corneous structures, etc.—or, when their function is to be a permanent one, remain in their original condition—as in glandular structures.

As the result of the above remarks, the following law of the development of morbid tissues may be proposed: Many pathological structures originate through previous cell-formation in a double form. The production of the cells, in such cases, occurs according to the first mode, as discovered by Schwann. All tissues, however, cannot be proved to originate necessarily and immediately from cells, and several we know certainly are not formed from them.

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[1] By the irrational application of the discovery of Schwann, the view has been for some time entertained to reduce physiology entirely to a cell theory, and to consider almost all tissues, which have heretofore been recognized as peculiar, to be composed of cells. Thus we have pus-cells, blood-cells, ganglion-cells, and even muscle-cells, etc., and he who cannot everywhere distinguish cells is in danger of being considered unskilled in microscopic examinations. It is almost overlooked that tissues, preceded in their development by cells, when fully formed, possess quite different properties from the latter. When a chemist has learned the properties of sulphuric acid, and later finds it to be composed of sulphur and oxygen, he does not think of applying the qualities of one of these to the former. An application of this kind, however, certainly has been made in physiology. A nerve-tubule, or a muscular fibre, is no longer a cell, nor does it possess the properties, react, or grow like the latter from which it was developed. From the false view which has been here opposed, our best works on general anatomy are frequently only histologies, and not general anatomy as originally conceived by the genius of Bichat.

SECOND SECTION.

THE ELEMENTS OF THE TISSUES COMBINED IN PERFECT OR IMPERFECT TISSUES AND ARRANGED ACCORDING TO THE PROCESSES OF DISEASE.

§ 8. THE TISSUES AND ELEMENTS OF THE TISSUES IN AN IMPERFECT CONDITION OF DEVELOPMENT: CYTOBLASTEMA, NUCLEOLI, NUCLEI, AND CELLS.

First Class.

Proteine predominating.

1. Amorphous or finely-granular substance.

This is without a trace of organization; even the ordinary arborescence presented by coagulated fibrine. It is found only in scirrhus, and is that material deposited among the fibres which gives the tissue its characteristic hardness.

2. Nucleus-like bodies in an amorphous or finely-granular dry substance.

To this case belong tubercle and typhoid matter. From neither are fibres or vessels ever developed. Once deposited, they operate as foreign bodies in the positions they occupy.

3. Nuclei in a liquid albuminous blastema.

To this category belong the corpuscles of medullary cancer, of pus, and those found in catarrh of the mucous membranes, of glandular ducts, especially of the kidneys, of the gastric glands, of the glands of Brunner, and of the duodenum.

4. Jelly, or an amorphous gelatinoid matter, in which, at a later period, cells, fat-globules, and isolated smooth fibres may appear, as in colloid.

5. Cells with a rarer accompaniment of others prolonged to fibres.

The cells are either simple or endogenous. The latter frequently occur in large quantity in medullary cancer, sometimes in scirrhus, in tumors of the mucous membranes, and occasionally in catarrhal affections.

The cell-structures frequently approximate, in their form and their chemical relation, to those of the organs within, or in the vicinity of which they are developed. Thus, in epithelial tumors, with or without ulceration, the cells are like those of the normal epithelium;[1] and, in the same manner, the cells of medullary cancer of the liver frequently are quite like the hepatic cells.

Second Class.

Carbon predominating.

1. *Pigment.*—The black pigment of most pathological products exists in the form of free granules, or within cells, which are sometimes elongated in a fusiform manner. Generally, it consists either of carbon, and is, therefore, insoluble in mineral acids—as in melanotic tumors, in the lungs, skin, glands, etc.—or of sulphuret of iron, soluble in the latter acids—as upon the intestinal mucous membrane, frequently occurring in typhus.

The crystallized transformations of hematine into hematoidine found in blood which has been a long time stagnated, either within or external to blood-vessels, and more especially in that effused after rupture of the Graafian vesicle, were first accurately investigated by Virchow.

According to the latter, the hematoidine appears in the form of spherical bodies, granules, and oblique rhombic prisms, or perfect rhombs; is yellowish-red, red, or ruby-red, and is insoluble in water, alcohol, ether,

[1] To speak of epithelial cancer, is as unnecessary as to adopt an hepatic cell-cancer.

acetic acid, and weak mineral acids. In hydrate of potassa it becomes spongy, and then crumbles into granules which gradually dissolve. In concentrated mineral acids—as, for instance, sulphuric acid—the crystals lose their sharp contour and break down into granules, which become brownish-red, then green, blue, rose-red, and, finally, dirty yellow. According to my own researches, the crystals of hematoidine, of which the chemical composition is yet unknown, although its origin is undoubtedly from hematine, sometimes exhibits a very variable relation with the same reagents. Thus, in one case, I observed the rhombic crystals break up into red granules with a considerable development of air-bubbles, which probably indicate a combination of the coloring matter with carbonate of lime. Hematine, or the red coloring matter of the blood, however, does not only undergo gradual conversion into granules and crystals of hematoidine, but also into black pigment, usually found in the form of granules, and very rarely in that of crystals. This transformation occurs either by the gradual solution of the walls of blood-corpuscles, leaving only red or black granules, which may associate in masses, and become enveloped in a cell-membrane, thus constituting red or black pigment-cells; or masses of blood-corpuscles fuse together and undergo similar changes to those just mentioned, and, notwithstanding the blood-corpuscles appear to remain unaltered in composition, their coloring matter is no longer soluble in acetic acid. In this manner groups of blood-corpuscles may become enveloped in a newly-formed cell. (See Plate III.) In a third case, the blood-corpuscles may remain unchanged in their form, and the coloring matter transude and become converted into the forms of hematoidine.[1]

But although we conclude that hematine may be transformed into black pigment-cells, from the simultaneous presence of these with such as are red and are gradually undergoing the change of color, yet I am far from considering it proved that most melanotic tumors originate from effused blood and directly from hematine, for I have frequently examined large tumors of the kind mentioned without detecting any indication from which a previous transformation of the blood could be inferred.

That red and black pigment-cells originate in the manner stated, may be concluded from the fact that in the same specimen all stages may be observed, from the formation of granules to the fully-developed cells; but that previously-existing cells may become infiltrated with pigment granules[2] I do not deny, although I consider such a mode of origin rare in pathological structures.

2. *Free Liquid Fat.*—Oleine, in large or small drops, frequently occurs within the investing cells of the ducts and terminal follicles of glands, as in stearosis of the liver and kidneys. The deposit is most frequent in the hepatic cells; the cells of the tubuli uriniferi being more disposed to be detached by the penetrating fat. Further, newly-formed cells frequently become infiltrated with the latter substance.

Fat also occurs in the form of granules of uniform size, from the $\frac{1}{8\,9\,9}$ to the $\frac{1}{3\,9\,9}$ of a millimetre, consisting of oleine, associated with proteine or with the solid fats, as in exudations.

In the crystalline condition, margarine occurs rarely in the form of acicular crystals mingled with other substances. More frequently, cholesterine is found either alone—as in cholesteatomatous tumors—or associated with other deposits. In the former case, it has a pearly lustrous appearance, and is crystallized

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[1] Dr. Lebert has communicated to me a new form of hematoidine crystals, which is represented in Plate I. It consists of long needles, frequently arranged with great regularity.

[2] I think it highly improbable, under any circumstances, that a solid granule, even of the utmost minuteness visible with the highest powers of the microscope, can endosmose through a cell-membrane. I know of no instance on record in which it has been actually observed, and, in some incidental experiments on the life of the organic cell, I found the finest particles of carmine, estimated to be about $\frac{1}{8\,5\,0\,0}$ of an inch, would not endosmose through any of the vegetable or animal cells with which the substance was brought into contact.—TRANS.

in rhombohedral tables, or, in combination with other fats, it is contained within cells.

§ 9. TRANSITION FORMS TO PERFECT TISSUES.

1. Fusiform fibres constructed upon nuclei, and nuclear fibres produced by elongation of the latter. These constitute the characteristic form in soft polypi of mucous membranes, and that modification of the same in which cysts filled with serum are developed simultaneously within tumors composed of them—as in cystosarcoma and fibrous tumors. Further, they also compose those hardened flesh-like tumors of the skin, the so-called sarcomata. Again, they form firm masses, consisting of nuclei and nuclear fibres, as in some varieties of fibrous tumors of the uterus.

2. Branched flat fibres, not fasciculated, with numerous hollow or solid nuclei, accompanied rarely with sparse cells, and deposited in an albuminous, amorphous, or granular substance, as in albuminous sarcoma.

§ 10. PERFECT TISSUES.

1. Areolar and adipose tissues are frequent pathological formations. The former, with fat-cells, is the most common metamorphosis of plastic matter when deposited in excess. It is formed from exuded fibrine, the result of inflammation or the ordinary course of nutrition, and it is to be remarked, in the former case, its fibres originate according to the four modes previously indicated, *i. e.*, by cleavage and coagulation, by deposit around nuclei, by elongation of nuclei, and from cells.

Examples of areolar or fibrous tissue, developed as a result of inflammation, are presented by the pseudo-membranes; and others, produced in the course of physiological nutrition, are the adipose tumors or lipomata.

2. Tendinous tissue—at least so far as it resembles such in external appearance and in the arrangement of its fibres, is very frequently developed in the so-called fibrous tumors. Very often the latter present a distinct fibrous structure to the naked eye, and yet neither by the microscope nor through the finest sections can isolated fibres be separated or demonstrated. This condition is particularly the case when the fibres do not originate from cells, but by splitting or cleavage of plastic coagulated matter, as is frequent in fibrous and fibrinous polypi, in tumors of the uterus which have been produced from coagula of blood, and in old fibrinous exudations. The contour of the fibres in these cases often is indicated only by shaded lines.

3. Striated muscular tissue rarely originates independently of the muscular system, but lately has been observed by Rokitansky[1] in a tumor of the testicle. On the contrary, its production is frequent in hypertrophy of the muscles. The mode of development of this variety of muscular fibre is unknown. Unstriated or smooth muscular tissue frequently originates anew upon that of the stomach. The fibres of this variety are formed by the deposit of layers around a nucleus which subsequently disappears.

4. Nerve tissue, in the form of cylindrical fibres, I have observed in pseudo-membranes and in the rare cases of reproduction of cephalic substance after loss from hemorrhagic softening. The mode of development in both cases is unknown.

5. Mucous tissue. The pus-producing membrane and granulations alone belong to this category. It originates from cells.

6. Blood and bloodvessels. In pathological structures, the blood-corpuscles form earlier than the bloodvessels, are grouped in isolated points, and in size resemble those of the embryo, as in pseudo-membranes and in enchondroma. The new blood-corpuscles are at first pale, and their nucleus is frequently

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[1] Wiener Zeitschrift, 1849. [Virchow has since* imparted an instance of the production of striated muscular tissue in a tumor of the ovary, and, referring to the observation of Rokitansky, makes the philosophical remark, that it is not to be overlooked that the occurrence of muscular tissue in both cases in a generation gland—once in the testicle, the second time in the ovary—confirms our knowledge that in these parts also pathological reproduction is most energetic.—TRANS.]

[* Verhand. d. Phys. Med. Gesells. 1850.]

distinct, but disappears at a later period. The formation of bloodvessels is as difficult to trace as in the normal development, but I am acquainted with three modes in which it occurs, viz.:—

1. By prolongation of pre-existing vessels—a process which is more frequent than is generally supposed.

2. By the production of channels, the sides of which, at a later period, become defined by vascular parietes.

3. By development from cells. This I consider to be the rarest mode, having myself observed it but once.[1]

The new vessels, wherever formed, at first are longitudinally extended, and possess few anastomoses, but in time lose this character by the production of lateral branches, which, at the commencement, appear as cæcal processes.

The mode of origin of lymphatic vessels I have not observed, but, according to Schrœder van der Kolk, they occur in fully-developed pseudo-membranes.

7. Hair and teeth, besides occurring in the ovary, are also produced in sebaceous tumors. I never saw the hair growing from follicles, nor the root inclosed by a sheath; but, on the contrary, other observers state they have seen the roots of the hair of sebaceous tumors surrounded by a sheath.

8. Glands, like those of the skin, I have never seen myself, but Krause and Lebert state that they have observed such in sebaceous tumors of the skin.

9. Serous tissue, or, in other words, a vascular areolar tissue covered by an epithelium, occurs frequently in cysts, but, nevertheless, not all the latter are lined by an epithelium.

10. Cartilage.

In the production of this tissue, an amorphous blastema is the basis in which appear nucleolated nuclei, separated by light interspaces, and later, upon the simple or compound nuclei rises the cell-wall.

In this case, endogenous cell-production is frequent. The vessels of cartilage are developed after the origin of the blood-corpuscles.

The cartilage may be permanent, as in enchondroma, or it may ossify, as exemplified in the healing of fractures and in osseous tumors.

11. Osseous tissue is always preceded by cartilage in its development. Ordinarily, in its production, a network is formed, frequently quite similar to that of normal bone; then the nuclei of the cartilage-cells become converted into osseous-corpuscles by the deposit of calcareous matter, and, finally, the cell-membrane fuses with the intervening substance, and both become pervaded by the calcareous matter. The radiating tubuli of the corpuscles appear to be the remains of the unossified intra- and inter-cellular substance. Frequently, in the course of the conversion of cartilage into bone, the process ceases, constituting tumors, which I have described under the name of jelly-osteophyte—the osteoid of Müller. The bone-canals [Haversian]—or rather the medullary canals—are developed partly from vessels becoming calcified, and partly from branched areolar channels of the cartilage, and never from cells. The formation of vessels is by no means essential to the ossification of cartilage. The dental tissue is frequently developed in encysted tumors—as in the ovary—and the structure is quite like that physiological or normal.

12.[2] Calcification. No tissue of the body, except the hair, nails, and epidermis, is free from liability to calcification. It occurs in the non-vascular as well as in the vascular tissues. Thus are calcified the non-vascular inter-articular cartilages, the crystalline lens, epithelial cells of the mouth (tartar), cells of glandular ducts, fibrous and serous tissues, and even the muscular fibres and nerve tissues, though rarely, and, much more rarely, the glandular tissue. More frequent is calcification in pathological structures, as pseudo-membranes and tubercles, but very rarely in the cells of cancerous tumors.

Calcification is effected chiefly by carbonate and phosphate of lime.

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[1] Kölliker states he has observed the origin of vessels in the batrachian larva in these modes, by processes from the vena caudalis, from stellate cells, and by the production of channels.

[2] The description of inorganic deposits—concrements—belongs to the manuals of pathological chemistry and anatomy, and, therefore, I shall in this place mention but one form.

THIRD SECTION.

FORMATION OF THE BLASTEMA.

We have now to determine the sources whence the plastic substance is derived which furnishes the material for the development of the new tissues.

§ 11. NUTRITION, SECRETION, AND INFLAMMATION.

In the process of nutrition, the vascular system of each organ separates under its influence the necessary elements; urine in the kidney, bile in the liver, etc. In this manner, a large quantity of plastic matter is deposited in the structure of the pregnant uterus, which is transformed into fibres observable in various stages of development. If nutrition becomes abnormal, from causes which must remain unknown until we are acquainted with the laws of the normal process, there exudes from the bloodvessels a liquid resembling serum, as in simple dropsy, or only single elements may exude, as fat in stearosis. In other cases albumen and fibrine are effused, which experience little or no metamorphosis, or they become converted into perfect tissue, in the development of which, the organ, the seat of the secretion, exerts a powerful influence. The tissue produced, determines hypertrophy or forms isolated masses constituting tumors. In a final case, the blood stagnates, and its corpuscles accumulate and exeprience definite transformations; and the plastic constituents undergo one of the described metamorphoses within and external to the vessels. This process alone I designate by the name of inflammation.

Stasis of the blood-corpuscles and consequent metamorphoses of the blood, with or without exudation of proteine, are the only anatomical characteristics of inflammation. After stasis has occurred, the latter may disappear, and the plastic material continue to exude, as is the case in chronic suppuration. The name inflammation, however, should not be given up; because the other exudations above mentioned occur in the vascular system, and are entirely different from those of the inflammatory process, in the fact that they occur without stasis and alteration of the blood-corpuscles; and the word hyperæmia, or stasis, and even exudation alone, define inflammation as little as the earlier words tumefaction, heat, redness, and pain, used for all its forms.

From the preceding it is clear that, in disease, the plastic substance is deposited in two modes; without previous stasis of the blood, as in normal nutrition, and with stasis of the blood-corpuscles, probably through their agency, as in inflammation. The first process we understand very imperfectly, because we are unacquainted with the laws of ordinary nutrition; we know isolated conditions, in which, for example, fat or serum is deposited in certain tissues, but the numerous explanations which have been given of diabetes are sufficient to exhibit the paucity of our knowledge in this respect. With the mode of deposition of plastic matter in inflammation, we have a rather more exact acquaintance, and shall treat of it particularly.

Inflammation consists of several consecutive groups of phenomena or stages, each of which may terminate without necessarily passing into the next, and each, according to its nature, requires a varied method of treatment, already discovered unconsciously and empirically. These groups of phenomena or stages are as follows: congestion, hyperæmia, stasis, exudation, and gangrene.

§ 12. CONGESTION.

This stage sometimes precedes the others, but not necessarily.

By the term we designate an unusual flow of blood, through a certain portion of the capillary system in a given time, and the condition may be directly observed by means of the microscope. An acceleration of the entire capillary circulation may occur as well as partially in an organ or a tissue. In the former case it is consequent upon the central organ of the circulation (contraction of the heart and respiration), and in the latter it is possible only upon augmented secretion and nutrition.[1]

The more rapid change of material operates through the constant effusion from a continued renewal of the stream of blood in the capillaries. Such partial congestions are frequent in certain organs during pregnancy as in the uterus and the mammary glands. An organ, moreover, may receive an increased quantity of blood in consequence of the growth and augmentation of its vessels, as is also exhibited in the organs last mentioned. In the same manner pathologically an organ may receive more blood than usual, a remarkable example of which is presented by tumors.

§ 13. HYPERÆMIA.

Hyperæmia consists in an accumulation of blood in a portion of the capillary system, in arteries or in veins, produced by a retardation of the circulation. The latter condition in the entire capillary system of the body is incompatible with life; the most remarkable example of this being presented by cholera. Hyperæmia, or accumulation of the blood within the vessels, occurs in two forms. In the one case all the constituents, the liquor sanguinis and the blood-corpuscles, acccumulate, in the other the corpuscles accumulate with a diminution of the liquor sanguinis. The former may occur in the arteries and in the veins, and more particularly the latter, because they possess a high degree of dilatability. The other form alone occurs in the capillaries, for these cannot receive a large quantity of blood without effusion of the liquor sanguinis (exudation), or rupture of their parietes (capillary hemorrhage). In hyperæmia of the capillaries, the blood-corpuscles accumulate so as to fill up the lymph space, and come into immediate contact with the walls of the vessels, to which they adhere and thus increase the retardation of the circulating current. See Plate II. Fig. 3.

In this manner, vessels ordinarily conveying only a single row of blood-corpuscles, and imperceptible, become visible to the naked eye, and a tissue, which in the normal condition is pale, becomes bright red. The walls themselves of the capillaries have no participation in the production of the hyperæmia. As already stated in a publication in 1842, I have never seen in any organ or tissue of an animal, from any irritation whatsoever, a measurable dilatation of fibreless capillary vessels, and, although such a change is asserted to occur, to the present time, by Vogel, Rokitansky, and others, yet I can only explain the discrepancy from these latter having failed to make comparative measurements. Those made by Lebert give 0mm,005; a difference too slight to be taken into consideration, and attributable alone to the measurement, for it is well known that it is quite impossible to measure the same body twice, without obtaining a slight difference in the result. On the other hand, if dilatation of the capillaries does not occur in hyperæmia, it is quite as difficult to prove they undergo narrowing or contraction. The only mode in which the latter could possibly take place, is by condensation and contraction of the tissue with which the capillary walls are firmly connected.

Dilatation of the arteries and veins, however, fre-

[1] It is often asserted that an unusual flow of blood in an organ is produced by increased contractility of a portion of the arterial system, but this is an hypothesis; a stronger pulsation of the arteries of an organ is observed only when the return of the blood is impeded by an obstruction, which may exist in the organ itself or in some other, having a functional or an anatomical relation to the latter.

quently occurs, and this condition determines a retardation of the current of blood through them. Further, simultaneously with hyperæmia of a tissue, fusiform dilatations are observed in those capillaries and arteries surrounded by the annular fibrous tunic, and, likewise, the experiments of Weber have proved their contractility under galvanic stimulus. Experience confirms the view that diminished contractility of the arteries participates in the production of hyperæmia. When an artery becomes calcified, hyperæmia is easily induced in the organ which it supplies with blood.

§ 14. STASIS.

Stasis, or stagnation of the blood, as the term indicates, is the cessation of the circulation. It occurs in the arterial and venous, as well as in the capillary system. The alterations which the blood undergoes under these circumstances, are the same in the three systems, and are only modified through the constitution of the latter. In this place, I shall treat only of stasis in the capillaries, and propose to devote a separate chapter to that of the larger vessels.

If the capillary vessels are stopped up with blood-corpuscles, all movement of the sanguineous column ceases. The so-called lymph-corpuscles increase in number, and the lymph space has disappeared. The blood-corpuscles themselves undergo the following changes: They become grouped frequently in regular columns, resembling piles of coin; their coloring matter dissolves in the small quantity of remaining liquor sanguinis; and they become irregular, and fuse into a firm fibrinous mass. Or, they decrease in size, give up their coloring matter and a portion of their fibrine, and become united by means of a soft, gray, coagulated, albuminous matter, into mulberry-formed groups, the inflammation-globules. Accompanying this change, serum, stained red, exudes from the capillary walls, and these are themselves sometimes ruptured, corresponding to the condition of the so-called inflammatory engorgement. Or, the blood-corpuscles give up their contents to the liquor sanguinis, which, effusing from the capillaries into the surrounding parenchyma, constitutes fibrinous exudation. At first, the fibrine is always dissolved in a greater or lesser quantity of serum, but rarely remains a long time in the liquid condition, as in the so-termed *hydrops fibrinosa*, most usually coagulating immediately. Under the latter circumstances, the walls of the capillaries become invisible, apparently from their having been pressed together by the exudation; and an organ in this degree of stasis, as, for instance, a hepatized lung, contains a much smaller number of blood-corpuscles than in the normal condition.

The extravasation of liquor sanguinis determines, in all grades of stasis, swelling of the organ; and the impediment to the capillary circulation augments contraction of the arteries, and hence the beating of the part, which is therefore a result and not a cause of stasis. So soon as stasis has advanced to a considerable extent, the blood yet retained within the vessels presents a decided increase in the quantity of fibrine, which is also a result and not a cause of the condition. Thus, Zimmerman, in a first venesection, in a case of pneumonia, found 0.002 fibrine, and in a second, 0.008. The source of this excess appears to me to be the stagnated blood-corpuscles from which it escapes, for, with very rare exceptions, the more the latter decrease the more the fibrine increases. Others have sought for the source in the decrease of the albumen of the blood, but this is more naturally explained by the exudation of serum from the vessels; and, besides this, we do not find such a diminution with increase of the fibrine, if stagnation of the blood-corpuscles does not occur; as, for instance, in albuminuria from stearosis.[1]

§ 15. INFLAMMATION AND ITS TERMINATIONS.

From what has been stated, it is clear that the inflammatory process consists of several phenomena or

[1] In rheumatismus acutus, in which such an increase of fibrine also occurs, it is probably dependent upon the escape of this substance from the blood-corpuscles without preceding stasis. Coagula in the heart, and the disposition to local exudations indicate this.

stages, which may exist independently without passing into another, and each has already found a therapeutic treatment empirically; hyperæmia, stasis, and fibrinous exudation.

To these succeeds a fourth stage, which may prove very variable in its character; exudation being followed by resorption, or organization into tissues, or the formation of pus, or decomposition, that is to say, gangrene.

1. *Resorption.*—When this occurs, the stasis in the vessels disappears, the albumen is absorbed, and the fibrine is redissolved and also absorbed. Even coagula of blood in the pleura or peritoneal cavity have been frequently observed, in the lower animals, to become resorbed.

2. *Organization.*—In this process, the effused fibrine breaks up into minute globules, from the $\frac{1}{800}$ to the $\frac{1}{500}$ mil. in diameter, consisting of proteine and a portion of fat (exudation-globules), or it becomes organized into tissues according to the laws previously given, or it is converted into pus, in which case the exudation-granules serve in the formation of nuclei.

§ 16. CAUSES OF HYPERÆMIA AND STASIS.

Hyperæmia may occur in the dead body if in some portion of the capillary system the blood does not coagulate; and the blood-corpuscles following the law of gravity, sink and accumulate together. In the living body, however, it is produced when the return of the blood from some portion of the capillary system is prevented by pressure upon, or obstruction within veins, through destruction or retardation of the circulation in another organ, by reduction in the activity of the heart, or through loss of elasticity in the arteries. Both it and stasis may be determined by disorganization of the latter organs, or through disturbance of nervous influence. Further, they may be induced by elevated activity in an organ. Hyperæmia, also, may arise through the local application of chemical or physical irritants. All substances capable of combining with the blood or the capillary walls may produce such an effect; as ether, acetic acid, salts, hydrocyanic acid, etc. A high temperature or great cold, likewise, may operate in the production of hyperæmia. The most remarkable example of local stasis is observed from the chemical influence of a blister. Again, they may be induced by one of the accessory aids to the capillary circulation, secretion, exhalation, or respiration becoming diminished. The above causes, however, do not answer in all cases, to explain hyperæmia and stasis.

On this account, some have supposed a greater power of attraction than usual in the capillary walls or surrounding parenchyma for the blood; and others have mentioned paralysis of the vascular walls as a cause. Probable as the latter may be in the smaller arteries, yet until the present time neither mode of explanation has been proved. Even section of those branches of the sympathetic nerve which preside over the bloodvessels (Bidder), and, as I have myself observed in frogs, destruction of the spinal marrow and nerves of the lower extremities, do not induce the slightest disturbance in the circulation.[1] It may also be said of the asserted adhesiveness of the blood-corpuscles as a cause of hyperæmia and stasis, that it is possible, but has not been proved. An altered physical and chemical constitution of the blood must certainly have a great influence in the production of stasis. The remarkable cases of stasis of the blood which Thierness and myself were able to produce at will by nourishing

[1] A pin stuck into the web of a frog's foot produces neither hyperæmia nor stasis when no vessel is interfered with. As already stated by Stieglitz, the heart cannot send more blood into one than another organ, but the above-mentioned causes operating as stimuli, may induce an accumulation of blood, because its return becomes impeded. Quite as absurd is the supposition, that any irritation produces an increased flow of blood to the excited organ; and the old maxim, *ubi stimulus ibi affluxus*, should be altered to *ubi stimulus ibi stasis sanguinis*. Hyperæmia, however, does not always occur in the organ itself in which the circulation is disturbed; thus, diseases of the liver produce hemorrhages of the stomach and intestines.

animals upon oil, indicate how much the accumulation of an element in the blood can impede its circulation in the capillary vessels. The doctrine of attraction exercised by an irritated part upon a flow of blood, is certainly erroneous.[1]

The hyperæmia which occurs after death, is not distinguishable from that which takes place during life, and stasis only can be detected anatomically in the dead body in so far as it may have operated in producing alterations of form in the blood or exudation.

§ 17. OF PUS IN GENERAL.

Pus, which in the normal condition of the body is a homogeneous, yellowish-colored, thickish liquid, of the specific gravity of 1030 to 1033, when collected in a narrow glass tube separates into a colorless serum and a sediment consisting of solid bodies, the pus-corpuscles. The latter, which ordinarily give to pus its color, are spherical, but when not quite fresh, frequently have a fringed contour, are soft, yellowish-white, and usually measure on the average the 1-200 mil. in diameter. They consist of a soft, grayish, delicately granular basis, and cannot be distinguished certainly as vesicular, although they swell up considerably in water.

The constituent mass of the corpuscles, frequently covered by fat-molecules, contains usually from one to four nucleoli (by others termed nuclei),[2] commonly adhering together, and generally only visible after the granular matter of the corpuscles is rendered translucent, or dissolved by acetic acid.

The nucleoli are round, and present a depression, but sometimes are rather elliptical; are soluble in ammonia and caustic potassa, but not in ether or acetic acid. According to some observers, these so-called nuclei are at first always simple, and divide into several, or become indented, cordiform, under the operation of acetic acid; but this change I have not observed, nor have I been able to convince myself that in all cases they are originally associated together.

The granular matter of the pus-corpuscles dissolves rapidly or slowly in acetic acid.

Normally-formed pus contains no other constituents than those mentioned, except occasionally minute globules consisting of fat, or proteine.

Pus-corpuscles possess the construction above described only when perfectly formed. Besides these, corpuscles occur in pus which are somewhat smaller, or quite as large, exhibit no nucleoli, even after the application of acetic acid, and have a smooth or finely granulated surface. Frequently, they constitute the sole element of purulent effusions of serous membranes. Dr. Lebert has proposed for them the name of pyoid-globules. They occur in vigorous as well as in cachectic individuals. The nucleoli of the pus-corpuscle apparently in the pyoid-globule has already become fused into the nucleus.

Both forms of the pus-corpuscle I view as nuclei; and the hitherto so-called nuclei, as nucleoli, which in the second form, as in other pathological nuclear structures, may be absent. Pus-corpuscles become the nuclei of future cells, where such are formed; in which cases many more nuclei than cells are produced, and the surplus are voided, or again dissolved and resorbed.

§ 18. ON THE FORMATION OF PUS.

Pus may form in the blood within the vessels in liquid exudation from the latter, and from effused fibrine coagulated. I propose, in this place, to speak of the latter only.

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[1] In opposition, compare the hair-breadth positive results obtained by Axman on section of the sympathetic branches, with the words of Valentin (*Jahresberichte*, 1848, p. 164), who did not succeed in the same experiments, and thinks their repetition desirable.

[2] What induces me particularly to view pus-corpuscles as nuclei, is the fact that in granulations and the formation of cicatrices it is readily and directly conclusive that cells form upon pus-corpuscles, for the nuclei of young cicatrix cells, in appearance and chemical relation, are perfectly identical with the latter.

The formation of pus in the earliest stage is most clearly observed in the suppuration of serous membranes and upon blistered surfaces.

In the process at the commencement, in the exuded albuminous serum, minute molecules originate, averaging the 1-500 mil. in diameter. These appear to thicken into nuclear structures, for a new layer forms around them, and frequently the nucleolus becomes fused into it. This mode of the formation of a nucleus around the nucleolus may be directly observed in the liquid of a blister, in which the latter are distinctly seen with a clear border.[1]

In other cases, the exuded coagulated fibrine undergoes liquefaction, and in this the pus-corpuscles form in the manner just described, and are frequently observed still lying in a layer of granular or striated fibrine, as in many abscesses, and in gray hepatization of the lungs in which the fibrine, at first liquid, and then coagulated, becomes softened, and is then converted into pus. Such a change also constitutes the ripening of abscesses, and occurs in inflammation of the lungs in the transition from red to gray hepatization.

When pus is too early discharged, flocculi of fibrine are frequently found mingled with it.

Good or healthy pus has no chemically destructive action upon surrounding tissues, and these only become softened; but if their nutrition is destroyed by hindrance to the circulation, they are dissolved, and in this way, in furuncle, besides fibrinous flocculi, we find a portion of detached areolar or fibrous tissue constituting the core.

§ 19. DIAGNOSIS OF PUS-CORPUSCLES.

Formerly, I believed in the possibility of distinguishing pus-corpuscles, by means of the microscope, from physiological and other pathological structures which resemble them, but, at present, entertain a different opinion. The so-called lymph-corpuscles of the blood are undistinguishable from pyoid-globules, *i. e.* pus-corpuscles without nuclei, and the yellowish color is inconstant. On the contrary, lymph-corpuscles differ from the true pus-corpuscles in possessing a smoother surface and more indistinct nucleoli, which, even after treatment with acetic acid, appear smaller and less defined, and are more punctiform. The young nuclei of epithelial cells, as they occur in normal mucus in every irritation of a mucous membrane, either possess two or three nucleoli like in pus-corpuscles, or more frequently are without, as in the pyoid-globules, and they resemble both these in size and chemical relation, or are smaller, and more frequently dissolve much less rapidly, or not at all, in acetic acid. Sometimes the nucleus of perfectly formed epithelial cells exhibits the strongest resemblance to pus-corpuscles. From this, however, we are not to conclude pus and mucus are the same, but that a mucous membrane may form the same kind of nuclei as well under the influence of stasis as without it. Pus consists not only of its corpuscles, but of these with serum, as the blood does of corpuscles with liquor sanguinis. Nevertheless, from what has been stated, we are not to consider the microscopic investigation of pus as useless, for it may

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[1] To observe the origin of pus-corpuscles, the most convenient position is a blistered surface. The bulla at first contains only albuminous serum without molecules, but, twelve hours after the application of the blister, the liquid has become slightly turbid and yellowish from the presence of pus-corpuscles, which usually inclose a compound nucleolus, often visible without the aid of acetic acid, or, more rarely, a large simple nucleolus. At this period, many of the pus-corpuscles (nuclei) may be observed with a clear border to one-half of their circumference, which is the future cell-wall in the course of development. The latter process appears to continue for a short time, even after the removal of the liquid from the bulla, for, during the observation, the number of pus-corpuscles provided with the clear border considerably increase. Fig. 10, Pl. II. is a representation of this mode of cell development from a cicatrizing surface. In the liquid from the latter, which yet contained no trace of epidermal cells, after several hours, perfectly spherical cells with simple nuclei were observed to appear, so that I can confirm the observation of Helbert, that cells may form in organizable or plastic liquid removed from the living body.

be distinguished from many other liquids; and, on the other hand, the presence of epithelia frequently indicates the nature of the secretion, as do also inflammation-corpuscles, and mingled fragments of tissues often throw light upon the seat of the suppuration.

The physiological character of pus- lymph- and mucus-corpuscles explains the above difficulty. The former and the latter are certainly the early condition of cells, but the mucus-corpuscles undergo metamorphosis as nuclei to future epithelia much more rapidly, and thus become cells more quickly. The lymph-corpuscles, most probably, are converted into blood-corpuscles, as is indicated by their considerable increase after loss of blood, and their disappearance when the blood-corpuscles again augment.[1]

§ 20. CHEMICAL RELATIONS OF PUS.

Pus, which is of a weakly alkaline or acid reaction, or is neutral, has a specific gravity of 1.0409 to 1.027, whereas serum of the blood, according to Becquerel, in the male has 1.028, in the female, 1.027. The water in pus varies in its proportionate quantity in 1000 parts from 769 to 907, according to the authority of Bibra. In the male, the water of the blood is 779 parts in the 1000; in the female, 791.4 (Becquerel).

The quantity of albumen and corpuscles in pus, is 60 to 180 parts in the 1000 (Bibra); whereas, in the serum of the blood, the average quantity of albumen is, in the male, 69.4 parts, in the female, 70.4 parts (Becquerel). The fat in pus varies from 5 parts (Bird) to 24 parts (Bibra).

The salts of pus, Güterbogk found to consist in greatest part of chloride of sodium, a less proportion of phosphate, carbonate, and sulphate of soda, chlorides of potassium and calcium, a small quantity of phosphates of lime and magnesia, and carbonate of lime, and a trace of oxide of iron.

From a comparison of the above-stated facts, a resemblance is perceived between pus and the plasma of the blood, except that we miss the fibrine in the former, which, however, in a modified condition, constitutes the pus-corpuscles.[2]

A very considerable difference is observed in the quantity of fat which is very much greater in pus. The relative quantity of liquid and solid constituents is very variable in pus, though the latter generally are more abundant than in blood, and rarely less; circumstances probably greatly influenced by the character of the exudation. The greater concentration of the liquor puris in comparison with the serum of the blood, can only be explained by the participation of the blood-corpuscles in the production of the plastic matter.

§ 21. VARIETIES OF PUS.

Pus varies in appearance and composition, according to the elements mixed with it. The most frequent admixture is blood, besides which there occur also mucus, bile-pigment, and urine. Most of these can be detected with the naked eye or by the microscope. The organ or tissue in which pus is produced has a great influence upon its constitution. Hence, the milk or cream-like pus of serous membranes; the quantity of globules determining the physical difference. Much more important are the variations exhibited by pus in different diseases, depending upon abnormal nutrition, from general or local

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[1] Mucus contains little or no albumen, and no fat, whereas the liquor puris is strongly albuminous and contains fat, and therefore the liquid produced in irritation of mucous membrane is purulent, but the transition stages from mucus to pus are numerous. Further, a peculiar viscid, amorphous, transparent matter, mucin, forms the principal constituent of mucus, and incloses the nuclei and cells, but the latter are not essential, and may be entirely absent, as in the mucus from the glandulæ Nabothi. Mucus is a physiological secretion which may be increased as determined by the function of the mucous membrane. Pus is a pathological product determined by stasis, and formed from the entire blood-plasma.

[2] A peculiar substance, pyin, is mentioned as a constituent of pus by Güterbogk, but has not been constantly found by others.

causes. In such cases, the pus-corpuscles do not attain their perfect development. Sometimes they exhibit no distinct nucleolus, but contain only minute globules, which appear to be fat, and they are smaller than normal, and in this condition are to be considered as imperfectly developed. These (pyoid-corpuscles) may form the principal mass of pus, as in suppuration of serous membranes. Ichorous pus is distinguished by its great fluidity, its greenish or reddish color, its odor, and the construction of its corpuscles, which are in small quantity, very soft, irregular, indistinctly defined, and frequently covered with isolated molecules, and may even be nearly absent. Cachectic pus is either quite fluid or thickish, coagulated milk-like, and grayish-yellow colored. This variety frequently is difficult to recognize as pus with the naked eye, as in peritonitis, where it may readily be mistaken for the escape of matter from a perforation of the small intestine. In it the pus-corpuscles are soft, liquefying on the slightest pressure, gray, irregular, and not sharply defined, but, nevertheless, their nucleoli are distinguishable. The pus of dyscrasies, as in tubercle, scrofula, and cancer, always contains, besides the peculiar elements, a considerable quantity of fibrinous flocculi, which indicate at once to the naked eye its abnormal character. A distinctive characteristic, however, for the pus of particular dyscrasies does not exist, and the pus of syphilis is not distinguishable from that of variola, or glanders, etc., a fact which I proved years ago. A large quantity of fat in fine molecules is intermingled with the pus of dyscrasies. In sanies, sometimes vibriones are found.

Pus dried upon a glass plate puts on an arborescent appearance, consisting of the pus-corpuscles brought into contact, calling into mind a similar arrangement of the blood-corpuscles in rolls when a thin layer of blood coagulates.

When dried, pus-corpuscles become a third smaller and irregular, their nucleoli become indistinct, and they have some remote resemblance to the nuclear structures in typhoid exudation and tubercle, but the inference is by no means to be made that dried pus and these substances are the same.

§ 22. GRANULATION AND CICATRIZATION.

The liquid portion of pus may disappear by absorption, as may also the pus-corpuscles after undergoing solution. This is proved by experiments on the lower animals and observations on man, in which abscesses disappear without having been opened. Where there has been a loss of substance, the purulent fluid furnishes a plastic material to the formation of a more or less distinct fibrous structure, the cicatrix, which latter frequently covers itself with epidermal cells. But very frequently suppuration determines the production of a new organ, which in turn separates pus, until the loss of substance is restored. In this case pus-corpuscles form layers and gradually become true cells, and among them bloodvessels penetrate, often supported by a meshwork of cylindrical or nuclear fibres. This structure frequently invests the cavity containing pus, and is a true pus-producing membrane. Sometimes it consists of rounded wart-like eminences called granulations, which may form in all tissues capable of producing pus, as upon serous membranes, in glands, in areolar tissues, in bone, upon the periosteum, etc. Granulations are frequently converted into epidermal cells upon their surface, and under such circumstances have been sometimes improperly denominated epithelial cancer. When granulations arise in dyscrasies, they become the constant source of suppuration, and even produce an inoculable matter, as in the contagious inflammation of the conjunctiva. It is an anatomical fact, that the cicatrix produced in the process of suppuration is generally constituted of a different tissue from that of the pus-producing organ, in which only at a later period the lost tissues sometimes again appear. The contraction and diminution which are always observed to occur in the substance of the cicatrix, do not depend upon an inherent contractility of its fibres, as is frequently asserted, but upon resorption in a slightly vascular tissue. The reproduction of tissues is the property particularly of the exuded blood. When wounds heal without suppuration, *per primam intentionem*, it occurs by organization of the blood discharged from the cut or torn capillaries; an opinion advanced by Hunter, and perfectly correct according to my own observations.

FOURTH SECTION.

THE HISTOLOGICAL METAMORPHOSIS OF THE BLOOD.

The blood, which contains all the elements from which the tissues are developed, may organize itself immediately into them. It is not even necessary that it should be exuded through the walls of the vessels to construct new tissues. Hunter asserted the possibility of the immediate conversion of blood into tissue, but latterly the fact has been almost entirely overlooked, and I believe I was the first to prove this transformation by microscopic observation.

Blood may experience a transformation into tissue as readily within as exterior to the vessels; occurring, in the first case, in a very trifling degree in stasis of the blood; in the second, in blood extravasated into the surrounding parenchyma when the vessels are torn.

§ 23. METAMORPHOSIS OF BLOOD WITHIN ARTERIES, VEINS, AND THE HEART.

In the organization of blood-corpuscles, within the vascular system, they associate in groups of ten or more, and then become enveloped with a gray, albuminoid matter, soluble in acetic acid, which afterwards condenses, and thus constitutes a cell-membrane. The blood-corpuscles at first retain their hematine, and may either preserve their original size, or may undergo diminution. After the cell is formed, the red color gradually disappears, and is then observed filled with numerous dark granules (nucleoli), which consist of fat, a proteine substance, or pigment.

Sometimes, before the cell-wall is yet visible, a large, clear spot appears in the centre of the groups, which is the nucleus of the future cell, and occasionally two such nuclei are formed. This metamorphosis of blood-corpuscles into inflammation-globules and cells, cannot always be traced or proved, because frequently when the examination is made, the red color has already disappeared from the mulberry-formed globules. However, be it as it may, the existence of these inflammation-globules within a vessel is the only certain sign that a column of blood had stagnated during life. The length of time intervening between the commencement of stasis of the blood and the formation of the structures above described, according to my observations, is several days.

The explanation of the process can hardly be given with certainty. To form the globules, it appears as if from each constituent blood-corpuscle a portion of albumen and fibrine exuded, and another portion of these with fat remained.

The mode of transformation of the corpuscles into pigment granules, is problematical. At first of a red color, they then become of a rust or yellowish color, and finally blackish, and are also diminished in size. They no longer give up their coloring matter to water or acetic acid, nor are they soluble in these; so that a chemical transformation has taken place in the proteine as well as in the former substance.

Besides this change in color, and diminution in size of the blood-corpuscles,[1] in which, for the most

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[1] I cannot participate in the opinion of my honored friend, Dr. Lebert, that these colored corpuscles are never blood-corpuscles (as Kölliker concedes), but are newly formed from the hematine. I have too often and distinctly observed the transition forms. That perfectly preserved pale blood-corpuscles are observed with hematine globules in old blood-coagula, is quite correct. Compare Pl. III. Figs. 5 and 9.

part, the hematine remains in an altered condition, the formation of masses of pigment granules from hematine, which has exuded from blood-corpuscles without a change in their form, is also observed.

A further metamorphosis of inflammation-globules, or of the cells, with many nucleoli, I have not observed in blood within the vessels.

In the organization of the fibrine within vessels, it coagulates into fibres, which at first branch in an arborescent manner and are smooth, and at a later period become rounded. According to my observations, these fibres are never preceded in their origin by cells. In other cases, by the separation of fat into globules, inflammation-corpuscles, or cells of the second form are produced in the fibrine.

Sometimes the latter, before metamorphosis of the blood-corpuscles has yet commenced, or is completed, forms around them sheaths or canals, which are undistinguishable from the simplest capillaries. This fact has been observed by me only in the heart.

The organization of fibrine into fibres and cells, is a matter of direct observation; from albumen the process appears never to occur primitively, so that fibrine approximates more the fibrous tissues yielding gelatine, than albumen does.

In cancerous degeneration and colloid, cells are sometimes developed in coagulated blood within the bloodvessels around pus-corpuscles.

The above are the only histological metamorphoses of blood in the large bloodvessels.

Within the capillaries, in a similar manner, in stagnation of the blood, the blood-corpuscles become associated, and are converted into inflammation-globules, and if the stasis continues, the walls of the capillaries dissolve, and the liquor sanguinis, mixed with the inflammation-globules, extravasates into the parenchyma of the organ. This fact, however, is only inferred, and not directly proved.

A conversion of fibrine into fibres I have never yet observed within capillaries.

§ 24. METAMORPHOSIS OF BLOOD EXTERIOR TO BLOOD-VESSELS.

Much more numerous and manifold are the transformations of blood which has escaped into the surrounding parenchyma of lacerated vessels, and has not been resorbed, than occur in that within the vessels.

As in the latter case, the blood-corpuscles also form red, and then uncolored inflammation-corpuscles and cells, besides which, they frequently are developed into pigment cells, often filled with black granules, insoluble in mineral acids. The small corpuscles resulting from the transformation of the blood-corpuscles, however, do not always become inclosed in cells, but frequently remain accumulated in large irregular masses.

In the coagulated fibrine, cells originate by the two characteristic modes; and also fibres, areolar tissue, adipose tissue, and even osseous tissue. It is by the metamorphosis alone of this fibrine, that wounds heal *per primam intentionem*, and not by a new exudation.

Melanotic tumors, sarcoma, and osteoid sometimes owe their origin to blood which has escaped from the vessels.

FIFTH SECTION.

PYÆMIA.

PYÆMIA consists in a commingling of pus with the circulating blood. The pus is either the result of a transformation of a portion of the latter, or it obtains entrance into the circulation through veins accidentally opened.

The consequence of the admixture almost always, though not necessarily, is stasis in the capillaries, and the conversion of the blood of these into pus, with the formation of abscesses; and in this manner the latter may originate in greater or lesser number in the liver, spleen, kidneys, lungs, brain, and more rarely in other organs, as beneath the skin, in the muscles, and in the joints.[1] This transformation of the blood into pus, is most frequently induced by the spontaneous conversion of coagulated blood into that material.

The definition above given of pyæmia is not the usual one, but I hope the following explanation will justify its adoption.

On examining cases which have died after extensive surgical operations, and especially where suppurating wounds have existed, frequently abscesses are found in the lungs, liver, sometimes in the kidneys, spleen, or other internal or some external organ. This fact, long known, since the last century has been the subject of numerous theoretical and experimental researches to determine its character. These investigations, which have always borne the impress of the times, and the ideas of the prevailing school, evidently are not only of scientific interest, but are of practical importance, as upon the exactness of our knowledge of the production of such abscesses, we can alone depend for precautionary measures to diminish the great mortality which still follows amputations.

The first idea which obtruded itself as an explanation, was that the pus of a suppurating wound became absorbed, and was deposited in the organs above indicated, constituting the so-called metastatic abscesses. This view was supported by the usual diminution of suppuration in the wound, the absence of evident inflammatory symptoms in the organs which had become the seat of the metastatic abscesses in so short a period, and the presence of pus in the veins and lymphatics, frequently themselves uninflamed.

But to this explanation, latterly, the objection has been advanced, that as pus consists of a liquid with solid corpuscles, which cannot be resorbed through capillary walls, the pus-corpuscles in the circulation and abscesses could not have been derived from the suppurating wound.

Another idea became prevalent, that the abscesses were the result of local inflammations, and the pus within the veins was there formed through inflammation of these vessels (Dance). Some authors, but especially Blandin and Cruveilhier, adopted phlebitis as the cause of metastatic abscesses, and the latter even a "phlebite capillaire."

"It has been proved by strictly physical experiments," says Cruveilhier,[2] "that pus circulating with the blood stagnates in various parts of the capillary system, everywhere inducing inflammation of the

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[1] "Perhaps the time is not far off when we shall return to the view of De Haen, who considered that, under certain circumstances, pus could form in the blood, as does urea in the physiological condition."—*Andral.*

[2] Atlas, livr. xi. p. 8, pl. i.

venous capillaries or circumscribed inflammations, which more or less rapidly run their course to the formation of abscesses."

Finally, Sédillot very correctly remarked that pyæmia is the result of commingling pus-corpuscles with the blood, which stagnating in the vascular extremities, destroy capillary circulation, and induce the formation of small foci of inflammation. It is not the consequence of an admixture of a putrid serous liquid with the blood, as supposed by Bérard, for this would rather operate in the production of gangrene.

That pus may be introduced through open veins immediately into the circulating blood and become intermingled with this, and induce metastatic abscesses is at present not a subject of doubt. The occurrence of those rare cases in which such abscesses form without phlebitis, and the circumstance that usually a coagulum of blood incloses the pus within the veins, is variously explained by authors.[1] The coagulum, by most of the latter, is considered insufficient to prevent the entrance of pus into the circulation, and almost all agree that pus is separated from the inner surface of the veins, which idea, so generally prevalent, is the reason why the whole process of phlebitis as well as pyæmia has been misunderstood, notwithstanding so many excellent anatomical researches. But in what follows, I hope to prove that pyæmia originates by transformation of the blood within the vessels, without necessary participation of their walls, and that this transformation may occur from preceding stasis of blood in the veins even without the previous existence of abscesses.

§ 25. CONDITIONS OF PYÆMIA.

1. The irritation of the inner membrane of veins by means of foreign bodies, according to my experiments, neither induces redness in nor deposit upon it, and the same is the case with the lining membrane of the arteries.[2] Daily the veins are cut in bleeding, and nevertheless suppuration does not occur in them.

2. On the contrary, the more vascular external tunic of veins is frequently the seat of exudation, and less so of suppuration, as well from exterior irritants as from the influence of these in their immediate vicinity.—Primitive phlebitis. The pus, which is formed under these circumstances, can penetrate only to the lining membrane of the veins, in which position it can induce secondary stagnation of the blood within the latter, as in the reverse case stagnation of the blood within a vein readily induces inflammation of its cellular tunic, because the venous nutrient vessels which open directly into the vein are impeded by the closure of the latter.

3. This phenomenon does not in itself determine pyæmia.

4. The introduction of substances into the veins which cannot pass through the capillaries, as, for instance, when mercury is injected into the jugular vein, induces the formation of minute abscesses in the lungs around each small globule of the metal, which, however, do not contain pus, as formerly believed, but inflammation-corpuscles.[3] In a similar mechanical manner pus-corpuscles operate in the capillaries; destroying the circulation, and causing the conversion of their blood into pus.

5. Injection of a small quantity of pus into the veins does not determine the formation of abscesses, but these are always produced when a considerable portion is introduced. Nor does the injection of liquor puris into the veins produce metastatic abscesses, but the introduction, in this way, of a large quantity of pus-corpuscles always induces the formation of abscesses

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[1] Sédillot views phlebitis as the ordinary cause of metastatic abscesses, but with others (Velpeau, Jobert, etc.), gives cases in which such were found without inflammation of the veins, and attempts to explain them by supposing the latter to have become eroded, which, however, has not been proved, and in the normal suppuration certainly is not so.

[2] See Arteritis, Path. Anat. pt. 14, and Virchow's Archiv. Similar results were obtained by Meinel, and he has arrived at the same view as to the cause of pyæmia, for an account of which, see Wunderlich's Archiv, 1848.

[3] Pneumonia, Path. Anat. pt. vi.

surrounded by ecchymoses, and accompanied by rapid destruction of the parenchyma.

6. The principal cause of pyæmia, is coagulation of blood in the veins, which then undergoes conversion into pus, and is thus conveyed into the capillaries.[1]

7. This coagulation of the blood is induced especially under the following conditions :—

a. Through inflammatory thickening of the external tunic of veins from contact with fibrinous exudation and pus.

b. Through pressure of tumors upon the veins.

c. Through the accidental entrance of pus into veins from without, as in the suppurating wounds of amputation, and after ulceration of the venous parietes.

d. Through contact of thin-walled vessels with exudation undergoing decomposition, as in the case of the inner surface of the inflamed uterus after childbirth. Inflammation-corpuscles are formed upon the inner surface of the uterus after every delivery, particularly in the position which was occupied by the placenta. If this is not expelled or decomposed, stasis next occurs in the neighboring vessels, and this is the true source of the pus in the phlebitis of lying-in women. How, otherwise, could so large a quantity of pus in a few days transude into the veins through their thick walls?

e. Stases of the blood in a large number of capillaries of an organ frequently determine coagulation in its arteries and veins, as in pneumonia. Other observers, instead of viewing this phenomenon as a natural consequence, have considered it a cause of the inflammation of the lungs. In the same manner nephritis may determine coagulation and the formation of pus in the veins of the lower extremities.

f. Even continued pressure upon a part in which the circulation is less favored, as in the foot, sometimes induces stagnation of the blood in the veins of the whole extremity, sometimes giving rise in their vicinity to rapidly destructive abscesses, which appear to proceed from a conversion of the blood in the capillaries into pus.

g. The introduction of organic matter in a state of decomposition into the capillary system operates in producing coagulation of the blood in the veins. In this manner, the poisonous material of dead bodies and the matter of glanders give rise to metastatic abscesses, at first in the exterior part of the body, and subsequently in the internal organs.

This coagulation of the blood, whose most important causes have now been indicated, likewise in itself does not determine pyæmia. If veins feel hard, and become painful, the case is usually considered as one of phlebitis, but incorrectly, for a vein may be filled with firm coagula, and the limb be œdematous and painful, without a trace of existing inflammatory exudation, as I have observed in *phlegmasia alba dolens*.

9. If blood is coagulated in the veins, it may again become liquefied and the circulation be thus restored. This is not a cured phlebitis, but the coagula of blood have again become fluid, and the production of abcesses through exudation from the capillaries has been prevented.[2]

10. Or the stagnated blood undergoes transformations. It either forms inflammation-corpuscles, or its hematine undergoes conversion into pigment granules or cells, which, as before remarked, are the safest signs that coagulation of the blood in the vessels had occurred during life. The fibrine, under such circumstances, adheres firmly to the inner surface of the veins, and becomes converted into an irregular fibrous tissue, from which the vessels, with or without previous inflammatory exudation into their external tunics, are transformed into fibrous cords.

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[1] To the existence of two forms of phlebitis—in the first of which the inflammation of the venous coats is primary and the coagulation the result; in the second, the latter is the essential and the former secondary—attention was first directed by Rokitansky. Only in the fact that I consider the pus found in the veins in both cases to be directly formed from the blood, do I differ from the excellent Viennese anatomist.

[2] Such reliquefaction of coagulated blood in the capillaries is frequently observed in experiments on the web of the frog's foot, and also in man after venesection.

11. Or the coagulum is converted into pus.

12. I have already proved that inflammation-corpuscles and fibres may form in the blood itself; and it only remains to show the possibility of its conversion into pus.

13. It is a fact, known to all who have made frequent autopsies, that in case of abscesses and suppurations generally, veins with their parietes entirely uninjured occur filled with pus, and that this latter may be found within blood coagula, even in the heart itself. In such an instance the introduction of pus from a suppurating surface cannot admit of a thought. Cases also occur in which a vein is visibly filled with mingled blood and pus, and yet its walls are unbroken, and an abscess is nowhere to be found.[1] Such an one I shall hereafter describe.

14. The pus is formed at the expense of the fibrine of the blood, and not directly from the blood-corpuscles, which, however, undergo solution. In the process the fibrine becomes soft, grayish in color, and in it appear minute nucleoli, often surrounded by a clearer substance distinctly defined, which are to constitute the future pus-corpuscles.

15. The coagulum is rarely transformed into pus without coming into immediate contact with pus introduced into the veins, as after amputation-wounds, or unless the venous parietes are in contact with exudation and pus. In the case of arteries, the thickness of their parietes serves as a protection against the conversion of coagula into pus, and probably is the reason why this is so rarely found within them.

16. How pus in this case operates upon the blood is unknown, but the old maxim, "pus produces pus," here finds its full application.

17. Even yet the morbid process of the production of pus may be local, for a portion of coagulum may close it off from the blood above, or below and above. Pyæmia may thus not occur, though this is rarely the case. Of this description Cruveilhier[2] mentions one of phlebitis of a superficial vein of the mammary gland, from which he had emptied the pus, which was reproduced for a fortnight, when it terminated without further consequences, with the closing up or obliteration of the vein.

18. But usually the plug of coagulum is useless, and the pus derived from the transformation of the fibrine passes into the circulation. Sometimes, according to the observations of Blandin, Sédillot, and myself, the coagulum is entirely absent or is imperfect. In those organs in which foreign substances, introduced into the circulation,[3] are usually deposited, accumulations of pus form, surrounded by ecchymoses, which bear the impression of a suddenly arrested circulation in the capillaries, in which, as in gangrene, when the latter occurs, the tissues quickly die and become mingled in fragments with the pus; hence the peculiar appearance of these metastatic abscesses, which are deep, of a dirty gray color, and surrounded by dark ecchymoses.

19. These abscesses I do not view merely as the result of transmitted and accumulated pus, for pus-corpuscles can very well pass through certain capillaries; as, for instance, the large capillary vessels of the liver; but under the influence of the transforming fibrine, yet in a flocculent condition, stasis of the blood occurs, and a new formation of pus is the consequence.

20. Pus may directly enter a gaping vein by aspiration, in the same manner as air does. This is, however, rare; because, in amputations, usually the veins become closed before the suppuration is considerable. It is not the introduced pus which forms metastatic abscesses, for there is nothing to indicate that the quantity is sufficiently large for such a purpose; but it is the stasis and transformation of the blood, induced

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[1] In frogs, according to my observations and those of Weber, a remarkable quantity of lymph-corpuscles form in stagnated blood. It has already been mentioned that, although pus-corpuscles have no absolute distinctive characters, yet they are readily recognized, when they possess several nucleoli, from the smoother, indistinctly nucleolated lymph-corpuscles, in which view I entirely correspond with Dr. Lebert.

[2] Livr. ii. pl. i.

[3] We may here be reminded of my experiments, and those of Thiernesse, of nourishing animals upon oil, and injecting this into the veins; also to the researches of Cruveilhier.

in the capillaries of the organs reached by the pus, which produce them.

21. The reception of the serum of pus by resorption into the blood, for we have no evidence that pus-corpuscles can pass through the parietes of capillaries without previous liquefaction, does not induce pyæmia. This is proved by the frequently observed disappearance of pus from serous cavities after inflammation in the lower animals, or after injections in the same. The undecomposed serum injected in considerable quantity does not produce pyæmia, as has been already proved by Sédillot.

22. Pyæmia then consists in the transformation of the blood into pus within the capillaries and veins. It is not pus-corpuscles which form metastatic abscesses, but, with fibrinous flocculi, they give rise to stasis and transformation of the blood in the capillaries, and exudations from these, which result in the abscesses.

23. Analogous to this is the transformation of lymph into pus, which, in the so-called inflammation of the lymphatics, is certainly not separated from the walls of the latter.

For pyæmia to originate by absorption through lymphatics is not possible, because the pus-corpuscles cannot penetrate their parietes.

24. Suppuration in some position of the body usually precedes pyæmia, but this is not essential (see Obs. 38).

25. From what has been above stated, it can be understood why every injury of veins, inducing coagulation within, and suppuration in the vicinity of those vessels, is usually so dangerous.

26. The danger of pyæmia does not arise from the influence of any malignant property of normal pus upon the blood, for it is well known large accumulations remain a long time in cavities of the body, but from the mechanical impediment in the capillary circulation, to which it gives rise by inducing stasis, particularly when coagula imperfectly converted into pus are simultaneously carried along with the circulation. The mechanical operation alone of pus, however, is not sufficient in all cases of pyæmia to account for death. Such cases occur, on the contrary, in which the blood has lost its capability of coagulation, apparently the result of contact with pus in the act of decomposition (see Obs. 41), and no simultaneous production of pus is induced in other parts of the body.

§ 26. ON THE PURULENT DYSCRASIA.

All surgeons are acquainted with the fact, that frequently, without evident cause, in various external and internal parts of the body, numerous abscesses gradually or simultaneously form. The name of purulent dyscrasy may be retained for such cases, as nothing indicates that the blood is converted into pus within the vessels, and we must, therefore, admit a general disposition to the formation of pus through exudation from the blood.

§ 27. OBSERVATIONS ON PYÆMIA.

OBSERVATION 38.—Scarlet fever. Pyæmia without phlebitis in consequence of nephritis unaccompanied by external or internal abscesses.

A soldier, over 20 years of age (in the hospital of Dr. Lebeau), who stated he had never been previously sick, had an attack of scarlet fever. Suddenly the rash disappeared, and œdema of the lower extremities came on without albumen in the urine, with great pain in the left iliac region, and constant diarrhœa, with violent fever. After the occurrence of these symptoms, the patient died in perfect consciousness.

The left kidney was considerably enlarged. (See measurement, Tab. III. No. VII.) The cortical substance was firm and sprinkled with red. The medullary substance was very red, and its vessels not closed up. In the former, the epithelia of the tubuli had disappeared, and between these was deposited an exudation in the form of band-like striæ, rendering the pale tubuli difficult to isolate. The membrana propria of the organ could not be separated without simultaneously tearing away some of the substance. The right kidney was atrophied, but not lobulated, was yellowish white upon the surface and in some positions granulated. In section, the cortical substance was smooth and penetrated by striæ having a tendinous lustre, and everywhere between the tubuli, which were deprived of their epithelium, were numerous nuclear fibres, and only a few of the corpora Malpighi yet contained blood. The bloodvessels of this kidney were small, but their caliber was not obliterated. Liver very large and fatty. Pancreas fatty. Intestinal mucous membrane hyperæmic, without ulceration. Spleen, double the normal size, soft, and red. Crural and internal saphenous veins of the left lower

extremity contained, to the entrance of the former in the iliac vein, a bloody ichor mingled with soft coagula, in which pus was readily distinguishable with the naked eye, and which, beneath the microscope, exhibited numerous pus-corpuscles intermingled with the normal blood-corpuscles. Near the entrance of the crural into the iliac vein, it was closed by a coagulum of blood. The inner surface of these veins was unaltered, except being stained by the coloring matter of the blood.

The heart presented its endocardium reddened by imbibition, and both ventricles contained firm coagula of blood. The bronchia were filled with frothy mucus. The lungs were hyperæmic at their posterior surface, and their apex contained some calcified tubercles. Nowhere was there the trace of an abscess.

Remarks.—In this case nephritis had existed upon one side at an earlier period, had run its course, and terminated in atrophy of the kidney without any remarkable symptom; and it was only under the influence of the scarlatina, which always determines congestion of the kidneys with exfoliation of the epithelia of the tubuli uriniferi, that a new inflammation was set up in the other kidney, which gave rise to stasis of the blood in the veins of the corresponding lower extremity and its transformation into pus.

Observation 39.—Pyæmia. *Tumor albus* of the knee. Amputation. Fatty liver. Abscess in the lungs and liver. Pleuritis. Phlebitis and arteritis.

A boy, 15 years of age,[1] four and a half feet high, exceedingly emaciated, had in his left knee a tumor of considerable size; whitish, painful, and fluctuating. The leg was so bent that, with the thigh, it formed an obtuse angle, with the foot directed inwards. Several artificial openings communicated with the articulation, and emptied a purulent fluid, consisting of liquor puris and pus-corpuscles. The thigh was amputated on March 27, by Dr. A. Uytterhoven. The *tumor albus* presented itself as produced by infiltration of a flocculent, caseous pus (scrofulous pus), into the areolar tissue, aponeuroses, and muscles in the vicinity of the joint, and also into the capsular ligament. The lateral ligaments were destroyed, the crucial ligaments preserved, and the semilunar cartilages dissolved. The articular cartilages remained, but were thinned, and in some places were reddened. Upon the tibia, for the space of nearly three-fourths of an inch in diameter, the articular cartilage was gone, and in its position the osseous substance was softened, and the lacunæ reddened with a superabundance of blood mingled with pus. The periosteum of the tibia nearly to the ankle was thickened, and beneath it was a new ossific substance, spongy and in the form of lamellæ lying upon the bone, but not entirely enveloping it.

Upon sawing through the head of the tibia, the spongy substance was found softened and red, the cells enlarged, but without a trace of pus or tubercle.

The patient died April 3, with the symptoms of pyæmia. Autopsy the next day.

In the ununited wound of the stump was observed smutty gray pus. The stump of the thigh bone, for a few lines, was bare of periosteum, and in this position, was colored grayish black. By sawing through the bone, the medullary canal presented several abscesses, which extended almost to its head; and of these, one appeared inclosed within a serous membrane, but, upon closer examination, the latter proved to be formed by a vein. The other abscesses were infiltrated into the marrow.[2] The vessels, muscles, and nerves at the end of the stump, were united into a firm mass by fibrinous exudation. Within the mass the vessels presented the following characters: The femoral artery was not closed by a firm coagulum. The ligature was on the point of separating (in this case, later, hemorrhage would have occurred), and the fibrous coat of the vessel was considerably thickened from exudation, and had grown fast to the vein and nerves. The neurilemma of the latter was considerably thickened by exudation, and the primitive fibres were difficult to isolate.

The crural vein was gaping where it had been incised, and there was no growing together of the walls, but it contained from this position upwards to the next anastomosis, Fig. 10, Pl. I., pus mingled with blood. Upon the removal of the latter, the corresponding inner surface of the vein appeared yellowish and uneven, and covered with soft flocculi, which could not be removed from the reddened internal tunic, and which consisted of pus-corpuscles associated together in a membranous form. These pus-corpuscles were about a third smaller than normally, although their nucleoli were visible, and they were mixed with a few oil-globules, Fig. 11.

Above the position in the vein just described was a soft coagulum, adhering firmly to the sides of the vessel, but not perfectly closing it. In the coagulum, the blood-corpuscles were distinct, but the fibrine was broken up into small nuclei, which were in every particular like the pus-corpuscles.

The fibrous coat of the vein was considerably thickened.

Liver 1900 grammes—therefore highly hypertrophied—inclosed a quantity of fat within its cells, and also presented a number of purulent deposits, with not well-defined borders, upon its outer surface, but in the substance some of the deposits were yet a little hard and of a yellow color; others were liquid. In the depth of the liver, the abscesses were less numerous. The large vessels of the organ were normal. Spleen soft, red, and 400 grammes in weight.

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[1] He had entered the hospital about six months previous to his death with an abscess above and below the knee. The latter was neither swollen nor painful, and the disease was developed in it while in the hospital.

[2] These abscesses in the medullary canal, which originate in the veins in amputations, are frequently alone the cause of pyæmia, while the veins of the soft parts remain in a healthy condition.

Gall-bladder distended with thin bile.

The kidneys presented their cortical substance somewhat yellowish. The right kidney weighed 160 grammes.

The left pleura was attached to the ribs by old pseudo-membranes. That of the right side was covered with very thin, sometimes granulated, pseudo-membranes, easily separable, and consisting of associated pus-corpuscles. In the corresponding lung, several abscesses were found in the upper lobe, and in these positions the substance of the lung was collapsed, and, in the liquid pus, fragments of cellular tissue of the former were observed (analogous to what occurs in furuncle).

The tissue in the vicinity of the abscesses was without deposit. The lower lobe had a flesh-like appearance, was without air, and not inflamed.

Heart normal; in the right side a small quantity of coagulum; weight 150 grammes.

Nowhere a trace of tubercle.

Observation 40.—Pyæmia after amputation. Abscesses in the medullary canal and lungs.

A young man, aged 20 years, fell from the story of a house and luxated an astragalus. The leg was amputated, instead of removing the luxated bone, on account of active inflammation which had taken place. The stump commenced, with suppuration, to cicatrize, after which fever and jaundice occurred, and the patient died 17 days after the operation.

The stump was imperfectly covered by the skin, and the ends of the bones were smooth at the edges, not reddened, and the periosteum, for the extent of an inch, was injected and thickened. In the muscles of the leg there were yet some black ecchymoses of blood. An inch above the amputation wound, among the muscles upon the inner side of the tibia, was found an abscess encysted in a pseudo-membrane. The veins in the vicinity of the wound were closed, not inflamed, their walls not thickened, and their inner surface was smooth.

The medullary canal, for about an inch and a half above the ends of the bones, was filled with pus, whilst the walls of the latter were healthy.

Both ventricles of the heart contained a soft diffluent coagulum. The right lung presented a number of abscesses formed of yellowish pus, around which, in some instances, a denser caseous matter formed a sort of capsule.

The liver was pale, without abscesses (which are frequent in pyæmia, although there was jaundice), but the hepatic cells contained much yellow pigment.

Hyperæmia of both substances of the kidneys, and in the pelvis were blood ecchymoses.

Observation 41.—Pyæmia. Phlebitis after venesection, without secondary abscesses.

A female, aged about 40 years, for an erysipelas of the foot, was bled in the arm. To prevent hemorrhage from the wound, which had been made too large, strong pressure was applied, in consequence of which an abscess formed beneath the skin around the wound. After a few days, the patient died with violent dyspnœa.

All the veins of the arm, except the axillary, which contained a firm plug of blood, were filled with pus, and the lining membrane was uneven, as if warty, from deposits of fibrine with numerous fat-globules. In some positions, the membrane presented red spots, which, however, were not vascular. The fibrous coat, in several positions was thickened. Besides the foregoing, there was pus in the crural vein of the extremity, affected by simple erysipelas without suppuration, and this vessel exhibited the same peculiarities, excepting thickening of the fibrous coat, as those of the arm.

Brain healthy. Simple emphysema of the lungs (as after great exertion in respiration), and nowhere the trace of inflammation in them. Cavities of the heart filled with quite fluid blood, but otherwise normal. The blood in both venæ cavæ liquid.

Liver hyperæmic; intestines anæmic; spleen soft and filled with dirty brown pulp. All the remaining organs healthy.

In this case, none of the organs presented secondary abscesses.

§ 28. Observations on purulent dyscrasia.

Observation 42.—Purulent dyscrasy, in consequence of decomposition of the blood.

A carter, 48 years old, who, two years previous to his death had attended horses affected with glanders, but not afterwards, six months since contracted a chancre. As he used no remedies for this, a portion of the glans penis degenerated into an ichorous condition, and, since three weeks, numerous small abscesses formed everywhere over the surface of the body beneath the skin. These were from the size of a pea to that of a walnut, and contained a dirty gray pus. One, the size of a five-franc piece, existed upon the breast. After remaining five days in the hospital, the man died from a previous condition of exceeding prostration.

Autopsy 48 hours after death, September 15, 1846. In the lungs were found nearly a hundred abscesses, the size of a nut. The small abscesses were all surrounded by a copper-colored border, but otherwise no inflammatory products were found in their vicinity. The blood was black-red, of a syrupy consistence in the heart, and contained only an inferior quantity of granular decomposing fibrine; the blood-corpuscles were dissolved, and a few lymph-globules only were visible. Old adhesions of the pericardium. The veins of the heart and those of the bones were carefully examined, and, with all other organs, were found to be healthy.

The pus presented, besides the pus-corpuscles, much amorphous fibrinous matter, which is peculiar to dyscrastic pus.

Observation 43.—Simple purulent dyscrasy.

A female, 20 years of age, who died after residing in the hospital fifteen days, and who never had been syphilitic nor had received external wounds or contusions, presented abscesses in the articulations of the hand, foot, and knee, of the right side, and also in the areolar tissue covering the sacrum. From the articulations the pus had been effused into the surrounding

areolar and muscular tissues, and about those of the hand the muscles and tendons were almost entirely destroyed. The articular cartilages were only partially softened or destroyed, and the bones, which were neither internally inflamed nor the seat of tubercles, were only superficially corroded. The veins about the diseased parts, though bathed in pus, were nevertheless not inflamed externally or internally, nor were they anywhere altered.

Brain normal, although there had been strong delirium. Liver anemic, 1400 grammes in weight, with its cells containing fat in minute drops. Spleen 200 grammes. Right kidney 200; left 190 grammes; small abscesses in both, as well in the medullary as in the cortical substance. Glands of the mesentery enlarged and pervaded by tubercle.

At the apex of the left lung was an abscess, and in its vicinity a somewhat softened gray tubercle, and near this, for the extent of a walnut in size, vesicular emphysema. A second abscess existed in the inferior lobe of the right lung, which was free from tubercles. In the bronchial glands was observed an almost liquid milk of lime-like matter, or tubercle in the act of calcification.

The flaccid, almost bloodless heart, weighed 190 grammes.

Observation 44.—Purulent dyscrasy terminating with tuberculosis.

A mason, over 20 years of age, came into the hospital in November, 1847, with a very slightly sensitive abscess on the outer face of the right leg. No cough, and digestion good. While residing in the hospital, an abscess formed in the left buttock and in the left wrist-joint, and then there occurred symptoms of pulmonary disease and hectic fever, of which the patient died the middle of March, 1848.

Caries existed superficially upon the articular surfaces of the tibia, femur, and patella, but none in the wrist-joint.

In the upper adherent lobes of both lungs there were thousands of miliary tubercles the size of a pin's head. Liver and heart fatty. Tubercles in the mesenteric glands.

SIXTH SECTION.

ON GANGRENE.

Life exhausts all tissues, and their elements are unceasingly renewed from the blood. When such a renewal ceases, the tissues and organs dry up, or more frequently undergo decomposition, usually under, but also without the influence of the air, and lose the determinate form necessary to their function. They become gangrenous, or, as we say of the bones, necrosed.

Gangrene, desiccation, or mummification (necrosis), and dying off, do not, however, have exactly the same meaning. Many tissue-elements of the body die off without becoming therefore gangrenous, that is to say, decomposed. In this manner, the epithelial cells of membranes die and are thrown off; the same is the case with osseous tissue, and this occurs without the structure of the tissues being particularly altered. Gangrene, on the contrary, is a true decomposition of the organs and tissues.

1. In gangrene, the latter break up into small molecules, which at first preserve the direction of the fibres entering into their composition.[1] The muscles lose their transverse striæ, the cells lose their walls, and break up into nuclei and nucleoli, which likewise finally dissolve, until a liquid, black-red, putrid ichor is formed, which contains only irregular molecules with numerous crystals never absent, fat-globules, and pigment-granules. This constitutes moist gangrene, to which even the blood itself is liable.

2. Or the tissues mummify without breaking up, and shrink together in a black leather-like mass, constituting dry gangrene.

The *gangrena senilis* frequently presents an example of the double form.[2]—Beneath the mummified skin is often found the moist gangrene.

The mummification of the fœtus in utero, and the gangrenous dissolution of the spleen, and the centre of many tumors, are examples of both kinds of gangrene without the immediate influence of the exterior atmospheric air. Where stasis of the blood has occurred, the latter operates very rapidly in producing gangrene. Thus, in strangulated hernia, the constricted portion of the red injected intestine becomes very rapidly black, as soon as the hernia comes in contact with the air after operation, so that each moment becomes of importance to the life of the patient.

The parts becoming gangrenous at first present a blackish-red color, then green, then brown, and then black, the change depending upon the serum, with the dissolved coloring matter of the blood, which exudes from the capillaries, or pours out from such as frequently are lacerated. The blood-corpuscles, when the blood participates in the decomposition, are reduced to minute, scarcely measurable, gray molecules, and the fibrine disappears entirely, or is found only in small quantity converted into a gray dirty pulp. The chemical alterations are quite unknown.

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[1] See my *Dissert. inaug. Berol.* 1836, and *Atlas der Pathologie:* Pneumonie.

[2] The serum evaporates from the surface of the skin, and, from the circulation being interrupted, it cannot be restored, and hence the mummification [desiccation]; while in the deeper parts the watery part of the blood remains, and hence favors decomposition.

Where no fluid blood is found in a dead organ, no alteration of color occurs, and thus necrosed bone appears almost unaltered, whilst carious bone is changed in this respect.

Gangrene exhibits an extraordinary variety in its extent and progress; thus I may refer only to the two extremes: the small grangrenous ichor, scarcely the size of a pea, of typhoid ulcers, and the gangrene of entire extremities in the aged.

The gangrenous parts are frequently separated, from those which are unaffected, by circumscribed inflammation and suppuration, when the gangrene is the result of local causes.

The causes of gangrene are:—

1. Cessation of the circulation in the arteries of an organ. If a small quantity of blood is permitted to pass through the fine interval surrounding the concentric blood coagulum, or plug in the arteries, moist gangrene occurs, but otherwise dry gangrene.

2. Cessation of the capillary circulation. Hence, mortification is a frequent result of inflammation.

3. Excessive failure of nutrition and poverty of the blood, as in gangrene noma [cancrum oris], or gangrene of the cheeks and of the mouth. Long-continued disturbance of the function of an organ, as instanced by gangrene of the lungs from catarrh.

4. Long-continued disturbance of the nervous system; as in the frequent gangrene of the lungs in cases of diseased mind; also in the gangrene after typhus.[1]

5. In consequence of decomposition of the blood from the introduction of putrid substances, or the agency of contagion and poisons. To this category belong the gangrenous abscesses of glanders, anthrax, gangrene from the use of *secale cornutum*, and the kind of mummification consequent upon the use of the peculiar poison developed in sausages. These operate in a manner analogous to putrid flesh in the decomposition of a solution of sugar, resulting in the production of alcohol and carbonic acid.

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[1] Typhoid?

SEVENTH SECTION.[1]

OBSERVATIONS ON HISTOLOGY.

I. ON STASIS AND EXUDATION.

OBSERVATION 45.—Congestion of the membranes of the brain.

A young man, who was intemperate, and was found drunk in the open air, died in a violent delirium after remaining one day in the hospital. The inferior surface of the investing arachnoidea was pervaded by a close network of vessels. The ventricles contained little serum. Liver 1350 grammes weight; very fatty. All other organs normal.

OBSERVATION 46.—Psoitis. Coagulation of the blood within the veins.

A female, about 30 years of age, treated for coxarthrocace with consecutive luxation of the left os femoris. The left foot was strongly directed inwards, and apparently elongated. The limb was œdematous, and presented an erysipelatous redness. Beneath the fascia lata was found a considerable quantity of pus, which communicated beneath Poupart's ligament, with an accumulation exterior to the peritoneum in the psoas and iliacus internus muscles, which were nearly destroyed. The os ilium was superficially roughened, and the right psoas likewise had commenced to inflame, but the quantity of pus formed was yet small. The right foot was not swollen. An accumulation of caseous pus was encysted between the rectum and vagina. The left crural and iliac veins were thickened by exudation and grown fast to the surrounding areolar tissue, and their interior was obstructed by coagula attached firmly to the surface. Peritoneum without purulent effusion. Both lungs with crude tubercles, and attached to the ribs by old adhesions. Liver very fatty.[2]

OBSERVATION 47.—Diphtheritis.

A man, 21 years of age, a soldier. On entrance into the hospital, he complained of headache and difficulty of deglutition, which he ascribed to a cold.

March 13, 1848.—Cheeks red; skin very warm; pulse accelerated, resistant; much cough, with abundant sero-mucoid expectoration; pectoral sounds normally clear, hoarseness, lips swollen, apparently ulcerated but covered with plaques of a whitish crust, which were also strewed over the red lining membrane of the mouth; tonsils very much swollen; tongue thick, with a strawberry-like appearance. Little thirst, abdomen tympanitic; stools regular. Treatment: venesection, 15 ounces; 15 leeches; gargle of alum and honey.

14*th*.—Pulse same as yesterday. Blood with a voluminous clot, and covered with a thick crust. Bellows sound over the region of the heart. Respiration and gastric function as yesterday. T. venesection, 15 ounces; soda bicarb. and gargling; sinapisms to the feet. In the evening, venesection, 12 ounces, and twelve leeches to the neck.

15*th*.—Face appears better, skin dry, moderately warm; during the night had had frequent faintings; pulse 144 to the minute, pretty strong. The coagulum of the first bleeding was large and firm, with an imperfect crust; in the second bleeding, it presented the same characters, but the crust had better formed. No bellows sound at the heart; voice almost extinguished. Tongue white. Abundant expectoration. Stools solid. (12 leeches to the neck. Soda bicarb. internally.) Death in the afternoon, of suffocation. Autopsy, the following day.

A gray pseudo-membrane covered the tongue and the soft palate, but the pharynx to the commencement of the œsophagus was free. The tonsils were suppurating. The mucous membrane of the epiglottis, larynx, trachea, and bronchi to the fourth division, was covered with the same kind of pseudo-membrane just mentioned, which was so strong in the larynx, that the ventricles of Morgagni were obliterated. Upon removing the pseudo-membrane, which was granular, the mucous membrane appeared red, with its follicles much swollen.

The pulmonary tissue was not inflamed, there being only some blood accumulated at the posterior surface of the base of the lungs, which were simply emphysematous with numerous air-vesicles beneath the pleura. The heart contained pretty firm coagula.

Stomach ecchymosed, with the follicles strongly prominent. Solitary glands of the small intestine hardly projecting; some of the plaques of Peyer reticulated, and consisting of bursted glandulæ only. Large intestine internally covered with a gray mucus.

Spleen double the usual size, and soft. Mesenteric glands swollen to the size of a pea.

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[1] The observations here communicated refer to the plates.

[2] The bursa mucosa, between the tendons of the psoas and iliac muscles, communicated on the right side, as is frequent, with the hip-joint.

Observation 48.—Fatty degeneration. Apoplexia serosa. Inflammation of the gall-bladder.

A female, 69 years of age, died suddenly. She was extraordinarily thick and fat, and weighed 300 pounds. The brain was 1200 grammes, and the lateral ventricles were much dilated with serum. The substance of the brain also was very moist (œdema).

Lungs at the posterior surface, hyperæmic. Pericardium surrounded by a very considerable quantity of fat, and united to the heart by old adhesions. The latter organ weighed 450 grammes. Ventricles yellowish and dilated, with the softened parietes infiltrated with fat. Endocardium red, from the penetration of blood. Aorta with the inner surface red, and with some calcareous lamellæ above the division into the iliacs. Liver 2000 grammes, very fat, and vascular. Gall-bladder double the normal size, projecting beyond the margin of the liver, with its serous envelop very vascular, and its mucous coat here and there covered by pseudo-membranes, consisting of fat-globules, and inflammation-globules. The parietes of the gall-bladder were about one mil. thick, and the organ contained bile, puruloid in color and consistence, arising from the presence of fat-globules, inflammation-globules, and cholesterine crystals.

A large quantity of fat in the mesentery and around the kidneys, which were vascular, and contained a little fat within the caliber of the uriniferous tubuli.

Observation 49.—Hemorrhage of the brain and spinal marrow. Inflammatory and serous softening of the latter.

A man, 21 years of age, by profession a soldier, had been in service ten months; earlier had had an attack of apoplexy, but without lasting consequences; since three weeks ill. The day before yesterday he had another attack of apoplexy (March 20). On the morning of the 22d he had complete paralysis of the upper, and incomplete paralysis of the lower extremities, but he complained of pains in them. Strong dyspnœa. Eyes glistening and injected. Skin hyperæmic. Pulse hard, regular, 108 to the minute. Respiration resonant. Threatened asphyxia, with rare cough, and frothy expectoration, which was adherent to the sides of the vessel. Tongue pale. Abdomen somewhat distended; since yesterday no passage. (Venesection twice; ol. crot. gtt. i.) Ten o'clock in the evening, the dyspnœa was stronger, and there had been no passage, notwithstanding the additional dose of two drops of croton oil. Bladder distended with urine, which was voided with difficulty. (Leeches and sinapisms to the feet.) Half past ten; cyanosis of the face. Pulse, 121 to the minute. Death at eleven o'clock, in perfect consciousness.

Autopsy.—Brain hyperæmic, not softened; with the lateral ventricles largely dilated with serum. At the inferior surface of the anterior lobe of the right cerebral hemisphere, to the extent of a five-franc piece, there was an effusion of blood between the arachnoidea and pia mater, and penetrating for some lines in the cerebral substance.

Beneath the arachnoidea of the spinal marrow was much serum, and at the central part of the upper third of the latter was a fresh effusion of blood about an inch in extent. Below this position the interior of the spinal marrow was considerably softened, gray colored, with very numerous inflammation-globules, while the exterior surface was normal in its consistence. The remaining two-thirds of the spinal cord was reddish-colored, softened to liquidity, but without inflammation-globules. Lungs and liver normal. Kidneys hyperæmic. Vessels of the brain and spinal marrow engorged with blood.

Heart normal, except that the mitral valve was thickened, and one lobe was shorter than the other.

The softening of the spinal marrow was partially the result of effusion of serum and partially of hemorrhage.

Ether dissolved the inflammation-globules, leaving behind a granular mass.

Observation 50.—Carditis purulenta. Abscesses of the kidneys.

A man 38 years of age, in service of a physician as coachman, performed duty to March 24, 1849, although a certain lassitude had been remarked for nearly the last fortnight. Feeling worse, he entered the hospital. The pulse was very quick, and there was great dyspnœa without particular sound. Bellows sound at the heart. Complained only of pain in the abdomen. Sudden death the same night (24th). Autopsy on the 26th. Height five feet two and a half inches.

Brain hyperæmic. Lungs hyperæmic, both weighing 1600 grammes, everywhere crepitant, without a trace of tubercle, and with their vessels free. The entire gastric mucous membrane strongly injected and softened. Mucous membrane of small intestine injected. Large intestine normal. Liver hyperæmic and hypertrophied, weighing 1800 grammes, without alteration of its tissue. Both kidneys hyperæmic, their weight somewhat increased, both substances highly red; upon the surface of the cortical substance were small abscesses, not definitely circumscribed, surrounded by ecchymoses. The matter of the abscesses was gray and hard, and consisted of completely preserved inflammation-globules, with others like pus-corpuscles, which appeared to be derived from a transformation of the former.

Heart filled with coagula, the blood-corpuscles of which were regular, and the fibrine somewhat granular. It weighed 300 grammes, and exhibited its nutritive vessels and pericardium in a normal condition. The muscular substance of the left side was remarkably hyperæmic; blood flowing from an incision upon the slightest pressure. Parietes and ventricular septum smutty gray with reddish points, softened, and in some places abscesses (about five), about the size of a small pea. The primitive muscular fasciculi were covered with exudation-granules, so that the transverse striæ were invisible, and were mingled with inflammation-globules, in the midst of exudation and occasionally infiltrated blood.

The musculi papillares of the left ventricle were likewise pale and dotted red, and contained very small abscesses.

In the latter, were commingled pus and inflammation-globules. The endocardium of this cavity was red, but not vascular, and not thickened, and here and there was covered

by pseudo-membrane. The mitral valve was thickened. The inner and middle tunics of the aorta were thickened and as hard as cartilage, and the inner surface was on this account uneven; and it was filled to the division into the iliacs with a syrup-like blood.

This was a very remarkable case, as carditis purulenta is rare and the course of the disease striking.

Observation 51.—True partial aneurism of the heart. Gangrene of the foot. Closure of the arteries. Calcification of capillary vessels. Softening of the brain.

A female, 52 years of age, who suffered from moist gangrene of the right foot. She had symptoms of insanity, but no paralysis, and after death the autopsy presented the following condition:—

Hyperæmia at the base of the lungs. Pericardium externally covered with much fat. Heart, 275 grammes; near its apex, at the posterior surface of the left ventricle, was a circumscribed, rounded, but slight elevation, which upon opening the ventricle appeared as a shallow cavity formed between the forcibly separated muscular trabeculæ, and having a few of the latter extended over it. The greatest circumference of this cavity was a little over three inches, and it was partially filled with clear yellow blood coagula, which extended polypi-like between the columnæ carneæ; and beneath these was a membranous laminated coagulation, in contact with the undestroyed endocardium, which lined the cavity and was continuous with that of the ventricle, and had beneath it a deposit of atheroma. The wall of this accessory cavity was only four mil. thick, but at its entrance was of the normal thickness of the ventricle. In structure, the wall was constituted of the endocardium, a reddish condensed tissue consisting of fibrous tissue with muscular fibres, with difficulty distinguishable with the naked eye, but found to be distinctly striated beneath the microscope, and the thickened pericardium.

This is, I believe, the first case in which true partial aneurism of the heart has been proved to exist by microscopic examination; for here the endocardium, muscular fibres, and pericardium formed the sac and thus fulfilled the conditions of aneurism, as laid down in the Atlas of Pathology, No. 17, page 3. The endocardium of the remaining part of the left ventricle was healthy. The mitral valve was quite healthy except a spot of atheroma, at the base of one lobe. Aortic valves normal. Aorta dilated; its lining membrane to the division with the iliacs was almost entirely destroyed by atheroma. All its coats were readily torn.

The iliac, femoral, and tibial arteries, on the contrary, were narrowed, contained atheroma in their parietes, and were almost closed by coagula deposited in a laminated manner, leaving only a narrow channel for the blood to pass. This closure was evidently the cause of the partial aneurism. Inner circumference of the aorta 80 mil.; of one femoral artery 16 mil. Only in the tibial artery of the gangrenous leg was the coagulum organized with a passage through it scarcely the breadth of a pin's point. The coagulation was previously produced by the atheroma merely.

Liver and kidneys rather fatty. In the lateral ventricles, that is, the corpora striata, presented complete softening (cellular softening). The softened substance of the brain appeared as if infiltrated with a network consisting of calcified capillaries, and larger, irregularly dilated arterial vessels. The softened matter consisted of a maceration of the brain-substance, to a red-brown pulp, mingled with coloring matter of the blood and serum, but no inflammatory products.

Observation 52.—Tumor of nuclear fibres. Development of the blood and bloodvessels.

A man, 35 years of age, since two or three months, was attacked by pricking pains in the upper jaw, then a tumor showed itself, which appeared to come out of the antrum Highmorianum, and penetrating the hard palate projected over the base of the tongue. The pains latterly had ceased. The tumor, 25 grammes weight, was enveloped in a loose cellular sheath, and in section was of cartilaginous hardness, and presented a varying gray, with yellow and red colored substance. In the gray matter were numerous blood-red islets, which, however, contained no bloodvessels, but red blood-corpuscles, rather larger than ordinarily, or those fully developed. They contained distinct nucleoli, and were $\frac{1}{100}$ mil. in diameter, and lay free, and arranged themselves mostly in regular meshes (not an uncommon phenomenon in the coagulation of a thin layer of blood), or were contained in numbers from 15–20, in uniform cells from $\frac{1}{15}$ to $\frac{1}{10}$ mil. long, and $\frac{1}{25}$ to $\frac{1}{20}$ mil. broad. Occasionally, these cells exhibited commencing cleavage or thread-like prolongations; and thus distinctly presented the origin of bloodvessels. The firm, gray, cartilaginous, hard substance, with sparse calcified particles at the flat basis of the tumor, consisted of fusiform fibres, between which were deposited pale blood-corpuscles inclosed in cells.

Observation 53.—Gangræna senilis, from closure of the arteries. Scoliosis. A female of 80 years of age.

Autopsy.—The gangrene commenced 10 months previously. The foot became quite mummified, black, and dry, then the disease ceased until, recently, the leg was seized with moist gangrene. The epidermis was separated, the papillæ of the skin were red, the muscles discolored, gray, and infiltrated with pus to the knee, and the tendons alone preserved their lustre. The femoral artery, with all its branches, was stopped up with firm red coagula, adhering to the inner surface of the vessels. In these coagula, the blood-corpuscles had become transformed into inflammation-corpuscles, and they also contained diffluent, puruloid, white masses, consisting of fibrine breaking down into granules, inflammation-corpuscles, and fat-globules.

The inner membrane of the crural artery was covered with sparse calcareous particles, and the cellular coat was condensed by exuduation. In the arteries of the leg, the coagula were much softened and discolored from the infiltration of ichor. The veins, also, of the leg, were filled with red but not adherent coagula, evidently freshly formed. Liver granular, hypertrophied, and fatty. Kidneys normal. Lungs normal. Heart large, with calcification of the aortic valves, also of the aorta and iliac arteries.

II. DISEASES OF THE CARTILAGES AND BONES. CALCIFICATION. ATHEROMA.

Observation 54.—Tuberculous tumor albus. Amputation. Ossific cicatrization of the bone stump. Tubercles of the periosteum of the ribs and of the lungs.

A man, 26 years of age, entered the hospital July, 1848, with a scrofulous ulcer in the left axilla, which had existed three weeks. While in the hospital, a tumor albus was developed in the knee; a fistula formed in communication with the joint, and fever supervened. Percussion upon the chest beneath the right clavicle, gave a somewhat weak sound, and the respiration was puerile; and no cough, but red cheeks. February, 1848, the diseased lower extremity was amputated. The periosteum of the femur nearly to the position of the amputation was uneven and thickened by exudation. The capsular membrane of the knee was almost entirely destroyed by suppuration; the neighboring muscles were suppurating; the areolar tissue was condensed; the articular surfaces of the femur and tibia were yet about half covered with cartilage, which was normal in color, without a trace of vascular injection. Where the cartilage had disappeared, the surfaces were covered with soft reddish granulations growing from the bone-cells, and consisting of capillaries and nuclei, rather larger than blood-corpuscles. In some positions it could easily be seen how the vegetations growing beneath the cartilages separated them.

The surfaces of bone deprived of cartilage were not infiltrated with pus, but were red, and their cells were enlarged. The osseous substance was softened, and the enlarged cells contained a matter consisting of infiltrated tubercle and fat. In the centre of the femoral articulation was a large, softened place, while the surrounding portion of bone was very dense.

Evidently, the pus of the articulation did not arise from the bones unaffected by caries; that is, ulceration, but was produced from the synovial membrane after destruction, and cessation of nutrition of the articular cartilage, in the same manner that inflammation of the ribs induces pleuritis.

Although the wound of amputation healed well, the patient died exhausted from the suppuration of the unclosed ulcer of the axilla. In the last days of illness there had been delirium and violent pain in the forehead. There was a very large quantity of serum beneath the arachnoidea, and at the fossa Sylvii of both sides were sparse, small, tuberculous granulations. In the upper lobe of the right lung were about ten tubercles as large as a bean, and softened in the centre: the left lung was without tubercles. Beneath the periosteum of the upper right ribs, near their articulation with the vertebræ, were several tubercles, the size of a walnut, softened in the centre, and projecting into the cavity of the chest where they were covered by the unaffected pleura. Heart normal. Liver straw-colored, fatty. Kidneys hyperæmic. Mucous membrane of the small intestine with tuberculous ulcers. The ulcer in the left axilla had been produced by suppurating tubercles.

The amputated femur contained a smutty red marrow, and the unossified extremity of the medullary canal was perfectly closed by an inserted plate of bone several lines thick, and enveloped by a thick periosteum. The veins and arteries of the stump were closed for some lines by a red fibrous coagulum. The extremities of the nerves were rounded.

Observation 55, *a*.—A man, 58 years of age. Tuberculosis. Hemorrhage of the bowels. Ossification of the larynx.

Both lungs with tuberculous caverns. Liver fatty.

In the small intestine were numerous ulcers, which had originated in tuberculous infiltration, and from the vascular bottom of which a considerable quantity of blood had been poured out.

Larynx without tubercle or ulceration. Thyroid cartilage considerably ossified. [Why this should be reported is not easy to understand, as ossification of the laryngeal cartilages is not an abnormal condition in elderly persons.—Trans.] As in ossification in the fœtal bones, two substances were present: one corresponding to the first period of the process, in which the bone is spongy, red, with numerous developed capillaries, and the cartilage-cells filling with calcareous matter; the other corresponding to the formation of Haversian canals and compact substance.

Observation 55, *b*.—A woman, 86 years of age. Simple emphysema of the lungs. Granular fatty liver. Hypertrophy by dilatation of all the cavities of the heart, which was covered with a thick layer of fat. Ossifications of the mitral and aortic valves, and also with atheroma in the aorta until its bifurcation in the iliacs.

Observation 56. Enchondroma.

A boy, about 14 years of age, five or six years ago received a contusion of the middle finger, in consequence of which a rounded tumor, the size of a walnut, formed upon the second joint. The tumor had the color and consistence of cartilage, and, for the most part, was constituted of nuclei, and only occasionally of a few cells. In its midst were numerous blood-puncta, consisting merely of blood-corpuscles and resembling those of the fœtus in their size.

Observation 57.—Commencing development of an osteophyte from the upper jaw in a man 30 years of age.

The tumor was attached by an osseous pedicle in the fossa canina of the upper jaw. It was rounded, weighed 10 grammes, and the skin upon it was movable. It was enveloped in a membrane, readily separable, ½ millimetre thick, and consisting of epidermal cells. The tumor itself was composed of a peripheric, bluish, cartilage-like matter; fibres moderately long; nuclei insoluble in acetic acid; and a yellowish horny nucleus. The latter consisted entirely of bone-corpuscles.

Observation 58.—Osteo-malacia, pyelitis, nephritis calculosa, and fungus medullaris.

A man, 37 years of age, by trade a smith, of athletic constitution, had been a soldier, and, five years before his death, as a pioneer, had worked in the water a whole day, after which, according to his own statement, he was seized with rheumatic pains, which he had tried to overcome by the use of large

quantities of cod-liver oil, which was followed by softening of the bones. I saw the patient several years before his death in the hospital, and afterwards made the *post-mortem* examination, and, up to the present time, never saw a case in which there was so great a degree of softening of the bones.

The head, the limbs, and the vertebral column, from softening, had acquired the most singular forms. The vertebral column was curved laterally, and the head exhibited varying external depressions and elevations; and the limbs were so soft that they could be bent in all possible directions, like pieces of flesh covered with skin, apparently being without bones. All the bones of the body, except the pars petrosa of the temporal and the os occipitis, were softened. The other bones of the cranium were rich in blood, their cells enlarged, and their thickness considerably increased, and, with those of the face and jaws, so soft that they could be cut by the scalpel as readily as cheese, or even penetrated more easily. The crowns of the teeth were normal, but their fangs, although grown fast with the alveoli, were softer than in the natural condition, so that they could be easily sliced into fine laminæ. Beneath the microscope, by transmitted light, the dentinal tubes appeared clear because they were robbed of their calcareous matter. This is probably the first time softening of the teeth has been observed in osteomalacia. The cervical vertebral bodies were not softened, which was otherwise the case with the vertebral arches and processes. The pelvic bones also were softened.

The highest grade of softening was presented by all the bones of the extremities, the muscles of which were yellowish and filled with fat, but the vessels were normal, as was the case also with the periosteum, which was covered with adipose cells.

The right tibia was 22 millimetres in diameter at the middle, and the corresponding fibula 12 millimetres. The compact substance, which also had a spongy appearance, formed a lamina only $\frac{1}{4}$ to $\frac{1}{2}$ millimetre thick, and of the spongy substance a few sparse bone fibres alone remained. The cavities of these bones were filled with fat, and, after the removal of this and the periosteum from the tibia, cut longitudinally, it was translucent enough, without further preparation, to distinguish beneath the microscope the bone-corpuscles, deprived of their earthy matter, and the Haversian canals.

Brain normal, without calcareous concretion in the plexus choroides.

Heart normal, with little fat upon it; all four cavities filled with syrup-like blood, and the fibres of the right ventricle covered with a little fat.

Lungs healthy; the left attached to the ribs. A bronchial gland calcified.

Liver hyperæmic; as relates to the size, normal. Spleen and pancreas normal.

Within the pelvis of both enlarged kidneys were numerous yellowish, porous calculi, the size of a pin's head (perhaps 100 in one kidney). The lining membrane of the calyces was pervaded by numerous capillaries.

The right kidney, which alone I examined, was 220 grammes weight. The medullary substance was deep red and frequently undistinguishable from the cortical substance, with which it formed a uniform flesh-colored mass. In some portions of the medullary substance were observed occasional interrupted striæ of a hardish, gray-yellowish matter, which proved to be calcification of uriniferous tubuli, and entirely dissolved, with development of air-bubbles in nitric acid. The external surface of the kidney, from which the tunica propria could be with difficulty separated, was covered with densely crowded, elevated, yellowish granulations, which consisted of the normal tubuli uriniferi with their epithelium, upon the outside of which frequently there were calcareous concretions. Between the tubuli uriniferi was a strongly-developed fibrous net, in which was yet an occasional striated fibrinous exudation, and from which the tubuli were difficult to separate. There were occasional fat-globules between the tubuli, but not within them. The kidneys were surrounded by a great deal of areolar tissue.

The lining membrane of the ureters was strongly reddened by capillaries.

The bladder was contracted, and contained a little turbid urine.

The renal vessels were free. Some mesenteric glands were the size of a goose-egg, and infiltrated by a cream-like matter consisting of fat-globules and numerous spherical corpuscles, the size of blood-corpuscles, soluble in acetic acid, and resembling those sometimes found in medullary cancer.

III. CYSTOSARCOMA. COLLOID. CYSTS. STEATOMA.

Observation 59.—Cystosarcoma.

The tumor, the size of a walnut, situated upon the parotid gland, was enveloped in a sheath, and consisted of a firm, tendinous-like, lustrous tissue, inclosing small cavities containing a synovia-like liquid. The latter consisted of a clear serum, in which fusiform fibres and isolated nuclei were swimming. The firm matter consisted of parallel, cylindrical fibrous fasciculi and fusiform fibres.

Observation 60.—Polypus of the external meatus auditorius, in a female 30 years of age.

The polypus was attached by a pedicle, and at the free extremity was rounded. It consisted of a membrane $\frac{1}{2}$ mil. thick, composed of several layers of epidermal cells, inclosing a soft, gray-yellowish matter. The latter consisted of fasciculi of fibrous filaments with somewhat irregular contour, of nuclei, and epidermal cells $\frac{1}{3}\frac{1}{3}$ mil. in size.

Observation 61.—Polypus of the nose.

Externally it was surrounded by a thin membrane, and consisted of a soft, gelatinoid matter composed of fusiform fibres, and only one nucleated cell was found in the mass.

Observation 62.—Fibres obtained from a fibrous tumor of the uterus in a woman 67 years of age, who died of a double pleurisy.

Observation 63.—Tubercles. Steatoma.

A female, 74 years of age, had a faintly fluctuating tumor below the false ribs, from which on puncture blood flowed, and it was supposed to be a cancerous tumor. After death it was found to be a non-lobulated, fatty tumor, with prevailing areolar tissue, situated beneath the skin, and so intimately connected with the muscular fibres of the obliquus abdominis that it could not be detached without force. Here, then, was a non-malignant tumor with the appearance of pseudo-fluctuation of medullary cancer, the adhesion of acancerous tumor, and the hemorrhage from puncture.

Tuberculous caverns in the lungs. Fat in the tubuli uriniferi.

Observation 64.—So-called congenital ranula.

In a new-born child, a cyst consisting of several cavities, the size of a pigeon-egg, bluish, and fluctuating, was situated upon the frænum linguæ. On puncture, it exuded a viscid bluish liquid, like serum, but was not coagulable by alcohol, containing numerous round cells from $\frac{1}{50}$ to $\frac{1}{40}$ mil. in diameter, either inclosing several nucleoli from $\frac{1}{500}$ to $\frac{1}{400}$ mil., or one or several nuclei of the size of blood-corpuscles. Occasionally, the cells were contained within parent cells, and sometimes they were fusiform. The cell-wall in acetic acid became paler but did not dissolve.

Observation 65.—Colloid of the ovarium in cysts, and in an areolar form. Medullary cancer. Calcification of the mesenteric glands.

Both ovaries formed two movable tumors of very large size, unattached to the neighboring parts, and weighing 2400 grammes. Each inclosed numerous cysts, not communicating with one another, and containing a jelly, and separated by a condensed areolar tissue, infiltrated with the same kind of jelly. The cysts were composed of a smooth membrane of indistinct fibres. Upon the right lobe of the liver was a medullary cancer, not softened, the size of a walnut. The coats of the stomach at the pylorus were all hypertrophied, thereby narrowing that portion of the cavity.

The liver weighed 800 grammes, and was not fatty; the spleen, 70 grammes; and the heart 120 grammes. The blood was almost without a trace of fibrine, but the blood-corpuscles were perfect.

Beneath the peritoneal lining of the diaphragm was some old exudation. All other organs healthy.

Observation 66. Colloid. Endogenous cyst formation. Cancer medullaris. A female 51 years of age.

In this case there was fungus medullaris in the stomach, and about 20 medullary knots mingled with smutty yellow jelly in the liver. Sometimes the latter and sometimes the medullary cancerous matter prevailed, and neither were contained in cysts, but were, nevertheless, circumscribed from the hepatic tissue by a thin layer of exudation. Between the rectum and vagina was likewise a considerable medullary cancer.

The ovaries were converted into cysts, the right as large as a child's head, the other much smaller, and within them the endogenous formation of cysts could be beautifully traced.

The larger ovary consisted exteriorly of a thick common cyst membrane, which, in many places, could be raised up from that to be immediately described, and was formed from the membrana propria of the organ. The inner surface of the common cyst membrane was pervaded by sparse bloodvessels, and was invested by a second serous membrane covered by a pavement epithelium, in which were groups of from 15 to 20 cysts, hardly visible to the naked eye, and filled with a clear jelly. This presented a fine example of endogenous cyst formation from a large parent cyst. Besides the young attached cysts of the latter, it contained a number of separated cysts of various sizes, but mostly about that of a walnut. These consisted of a very vascular fibrous cyst membrane, the inner surface of which was occasionally covered by an epithelium (roundish cells with simple or compound nucleus, rarely cylindrical like those of the intestine).

The contents of the cysts were jelly like, mostly yellowish, and rarely turbid or blackish. Sometimes they contained with this, transparent, structureless, membranous flocculi, resembling the tunica hyaloidea. These coagulated strongly by acids, and inclosed, besides inflammation-corpuscles and fat-globules, small cells.

Observation 67.—Steatoma of the testicle in a dog, whose other organs were normal.

The epididymis, vas deferens, tunica vaginalis, and albuginea healthy.

The testicle weighed, without the epididymis, 75 grammes, and it presented, upon its external surface, swellings from the size of a hazel-nut to that of a walnut. In section, it appeared lobulated, consisting of a mingled gray and red matter deposited in a vascular fibrous stroma, which circumscribed the lobes, and evidently resulted from the condensation of the septulæ testis. A milky liquid was expressed from the mass, consisting for the most part of fat-globules, but also of some albumen and inflammation-corpuscles. The latter were accumulated in yellowish masses the size of a pea, and were lodged in a kind of cavity. No cells were anywhere perceptible, and rarely apparent fragments of seminiferous tubuli.

IV. TRANSITION FORMS OF CANCER. ALBUMINOUS SARCOMA.

It is exceedingly important in practice to know that many tumors, whose structure is remote from the normal, are incompatible with the life of the organ in which they are situated, and after removal, in a longer or shorter period, may return, or finally may be replaced by true cancerous tumors. We, unfortunately, are yet but little acquainted with the history of these tumors, which I have denominated transition forms of cancer or cancroid. Some ex-

amples (lipoma fibroides, and some forms of fibrous tumors with fusiform fibres) have already been presented in this work. Without doubt, they sometimes are developed from non-malignant tumors, as from lipoma. Among them, the albuminous sarcoma, a form of non-malignant tumor first indicated by J. Müller, holds an important rank. They are enveloped in a sheath of areolar tissue, and produce pain only by pressure on nerves. More or less lobulated, always circumscribed from the tissue in which they have their seat, frequently presenting an apparent fluctuation, resembling in color the muscular fibres of the stomach and intestine, of a fleshy consistence, of a specific gravity of 1.0655, and commonly not, or accidentally only, grown fast to the skin which covers them, these tumors rapidly grow to an important size, and are always reproduced after extirpation, frequently after the lapse of many years, and finally terminate in the production of like tumors in the interior organs, which lead to death, or become transformed even into medullary fungus. Generally, they are only slightly vascular, but become richly so, if, as occasionally happens, large vessels penetrate them, which are probably sometimes developed from the blood coagula of hemorrhage. They never pass, excepting through mechanical irritation, into suppuration; contain much albumen, and consist of a fibrous net composed of isolated, branched, smooth fibres with interspersed nuclei, and more rarely simple round cells. Occasionally, the albuminous serum and intermingled nuclei may be expressed as a milky liquid, from which these tumors are frequently mistaken for medullary cancer, which, by attention to the characters just given, may be readily avoided. They should be extirpated only, and that in all cases quickly, when they grow rapidly and interfere with the function of the part in which they are situated. As before remarked, they are again reproduced, but the patient obtains a more or less greater interval of relief.

The longest duration of time in a case which I have observed is twenty years. Frequently, only after this period of time these tumors, on account of their bulk and inconvenience, oblige the patient to seek relief. The time required for their reproduction varies from some months to as many years.

The cases which follow are of great interest, because, in several instances, the patients were under observation for some years, and the examination of the extirpated tumors confirmed the diagnosis to such a degree, that, in Obs. 70, without a previous knowledge of the circumstances, from the nature of the tumor, I recognized two different ones removed from the same individual at different periods.

Albuminous sarcoma, according to these observations, occurs frequently in the areolar tissue and the mammary gland, generally isolated, and sometimes in numerous tumors.

Observation 68.—Sarcoma albuminodes, probably developed from a lipoma.

A major, 45 years of age, fell from his horse in 1843. Six or seven weeks afterwards a tumor showed itself upon the shoulder-blade and was extirpated, but returned after some months. It was again removed, but with the same result, and then was destroyed by caustic, but returned, and always increased in size. According to Dr. Denis, who removed the tumor once, it had the appearances of a lipoma. Four months after having been operated upon for the fourth time, the tumor was situated upon the muscular aponeuroses of the supra- and infra-spinatus fossæ of the scapula, and was again extirpated, April, 1848, by Dr. Seutin, and all remains destroyed by cauterization. The tumor weighed 170 grammes, was covered by the unaffected skin, from which it was easily separated. Internally, it was indistinctly lobulated, but not externally; was circumscribed with few visible bloodvessels, and in color and consistence resembled the muscular coat of the intestines; and from it could be expressed a whitish albuminous liquid containing nuclei. The whole tumor was surrounded by a loose sheath of areolar tissue. In some parts of the tumor were numerous normal fat cysts, and in the remaining and greater portion, soft, branched, not sharply defined, isolated fibres, which formed a net in which were deposited pale nuclei $\frac{1}{75}$ mil. and sparse cells $\frac{1}{25}$ mil. In one position only, in which the substance was yellowish and granular, the fibres were sharply defined and the cells numerous. In some positions the interior of the tumor was tendinously striated, and here had the appearance as if associated nuclei were being transformed to fibres.

The tumors contained much fat and albumen, but no gelatine.

According to a communication from Dr. Seutin, the tumor has again appeared (April, 1849) in the same position, and the disease has, therefore, continued for nearly seven years.

Observation 69.—Albuminous sarcoma, with cyst formation and hemorrhages.

A female, 52 years of age, had ceased to menstruate since two years. She had had eight children, of whom one only lived. Her parents had not been affected by any disease similar to her own. Ten weeks previously to having presented herself at the surgical clinic, April 8, 1849, a small reddish tumor appeared at the upper border of the right mamma, which only occasionally was painful. The right mamma was now one-third larger than the other, and its upper border consisted of several not very well-circumscribed tumors, of which two were somewhat pointed, and were distinctly fluctuating. Through acupuncturation—a yellowish albuminous liquid, with blood-corpuscles only, exuded. The nipple was not depressed, and the skin was partially attached to the tumor, but the gland was movable. On April 26th, the tumor having grown considerably, the diseased portion of the gland (about one-third) was extirpated. Upon section the tumor, surrounded by ordinary normal, loose, areolar tissue, at its periphery presented two cysts, filled with yellowish-green serum, the inner surface of which was covered with soft granulations consisting of nuclei, and a few vessels.

The fluid contents, partially emptied in the operation, appeared to consist of bloody serum, and some solid matter constituted of partially discolored blood coagulum. Between the cysts was a soft, gray-yellowish substance, firmly coagulating with alcohol, of the consistence of organic muscular fibres, without milky liquid, and capable of being drawn out into threads like fibrine, mingled with islets of a blood-red color. These latter consisted of round nuclei, among which were occasionally deposited fine reticularly, branching fibres, isolated or in fasciculi.

May 15th, the wound had almost united, and the mamma was hardly distinguishable from the other.

Did not, probably, in this case, a hemorrhage in the mammary gland give rise to the production of the sarcoma?

July 31st, of the same year, I again saw the patient. Since fifteen days a rounded tumor, the size of a walnut, had formed above the position of the cicatrix. It was well defined, movable upon the pectoral muscle, fluctuating, not reddened, and upon puncture exuded a milky liquid consisting of perfect cells with simple nuclei and nucleoli. The patient occasionally felt stitches in the tumor. An axillary gland of the same side was of the size of a hazel-nut, and movable, but not painful. The general health was good, but a transition to medullary fungus was evident.

Observation 70.—Compound sarcoma albuminodes.

A man, 46 years of age, laboring under emphysema of the lungs, had never been syphilitic, but 20 years ago had had a slight gonorrhœa, had tumors upon the right scapula, and one at the insertion of the left deltoid muscle, upon the breast, and upon the right thigh and leg; in all cases beneath the skin, which was movable upon them. They were without pain, except in places from the friction of the clothes.

One tumor upon the arm disappeared from pressure applied by the patient, whilst others returned. There were none on the face or head. The smallest were of the size of a pea, and the largest, situated upon the upper third of the right femoral artery, was the size of a hen-egg, and none were pedicellated. Most of them were situated upon the right side of the body, and were there particularly reproduced.

A tumor of the same kind had first showed itself upon the right foot, eight years previously, and was extirpated, and, after suppression a second time by the cautery, the others were gradually produced since three years. At their basis the tumors were distinctly lobulated, yellowish-gray, of the consistence of muscular fibres, and permitted the expression of a whitish liquid, which firmly coagulated in alcohol and acids, and contained cells with simple or compound nucleus, and occasionally mother-cells, from $\frac{1}{100}$ to $\frac{1}{50}$ mil.

The mass of the tumors consisted of branching, isolated fibres, which formed meshes containing cells, among which coursed a few capillaries filled with blood-corpuscles. Some of the cells had no nucleus, but only several fat-globules.

In some positions of the tumor were free fat-globules. Two extirpated tumors presented the same structure. The largest tumor, situated upon the crural artery, which, in the movements of the patient, was troublesome and painful, probably from pressure upon the crural nerve, I advised to be removed. It appeared to compress the artery; for its pulsation below was very feeble, and above quite strong. It was extirpated by Dr. Deroubaix, September 26, 1849, and was found to be situated in front of the artery without being attached to it. It had no processes, but was enveloped with a capsule formed of loose areolar tissue. It was the size of a goose-egg, and externally smooth; in section appeared richly vascular and lobulated, and consisted of a kind of firm, red, cortical substance, and a middle, soft, yellowish matter, thus resembling the appearance of the kidney. The microscopic examination presented the same elements as previously, excepting that from inflammation, softening had commenced in the centre of the tumor.

The wound healed *per primam intentionem*. It did not return again in this position, but a fortnight after the rapidly-growing tumor of the right shoulder was removed a new one showed itself, in October, which was again extirpated in December. The wound healed quickly, but another tumor formed over the right clavicle. Constipation and fever supervened, and the much-reduced patient died January, 1850. No autopsy was permitted. The tumors, after every extirpation, presented the same structure, and were never ulcerated.

Observation 71.—*Sarcoma albuminodes* terminating in medullary cancer.

A man, 37 years of age, a store-keeper, strongly built, whose father was yet living and whose mother died early in childbed, had a tumor at the lower extremity of the left thigh, in the vicinity of the external condyle, which he said was in consequence of a contusion. The tumor, the size of an apple, and not attached to the bone, was extirpated by Drs. Deroubaix and Huber, January, 1845, after having existed a year and a half. In three months it had returned, of the same size, and was without pain, and the skin was movable upon it; and in

December, 1846, was again removed, and the periosteum with which it had become attached was cauterized. It weighed 80 grammes, was lobulated, and was surrounded by a sheath of areolar tissue and muscular fibres, resembled in appearance and consistence the muscular coat of the stomach, and contained a few bloodvessels. It consisted of nuclei, sometimes nucleolated, insoluble in acetic acid, associated together with fusiform fibres in a coagulable, amorphous matter. No liquid could be expressed from the mass.

The tumor first removed had presented the same structure.

February, 1848, I again saw the patient, who sought relief from inconvenience in ascending steps produced by two tumors developed in the same position as previously, but who was otherwise healthy, the inguinal glands even being not swollen.

Both tumors were rounded, immovable, apparently flabby, not attached to the skin, but covered by the muscles, and evidently grown to the periosteum. The larger was the size of a walnut, and the skin over it bluish. Beneath the skin of the bend of the knee some indurations were perceptible, and upon the external surface of the tibia was situated a newly-formed tumor the size of a hazel-nut.

June, 1848, the thigh was amputated by Dr. Michaud, and in the following August I saw the patient healed, and asking for a wooden leg. Soon after, in November, the tumor returned in the form of medullary cancer, and the patient died March, 1849.

The interne of Drs. Michaud and Graves, imparted to me the following: The patient was dismissed in July, healed, but returned in December, and complained of pricking pains in the right lumbar region, back, and stump, which increased in the evenings. He was treated by bleedings, aperients, blisters, bark, quinia, and colchicum, without much alleviation. January, 1849, a tumor appeared in the left parietal region, which was elastic, with apparent fluctuation and softer centre, with a parchment-like crackling, accompanied with violent headache, corresponding to the position of the tumor. Some days later, the right eye, with little disturbance of its function, became somewhat protruded. The patient had fever and constant night-sweats.

From 22d to 23d of January, retention of urine, constipation, and paralysis of the right lower extremity, and pains in the more greatly protruded and now blind eye. Belladonna and acetate of morphia allayed the pains.

February 24, violent dyspnœa, which continued until death, March 4, 1849.

Autopsy.—Cranium. Two tumors, growing out of the surface of the dura mater, which they had pressed back into the brain. They were rounded and milk-white, had commenced to soften, and contained some small effusions of blood. One had produced the exophthalmia, the other had penetrated the bone [forming the parietal tumor, which had increased until death].

Thorax.—Two tumors, the size of a pigeon-egg, and yet hardish, besides other smaller ones, were situated beneath both pleuræ, more, however, beneath the right than the left.

Abdomen.—A tumor, the size of a new-born child's head, was situated in the left iliac fossa, and had destroyed the centre of the bone, and had extended into the glutæi muscles. A smaller one also was found in the left obturator foramen, which had affected the bony margins of this opening.

All the viscera healthy.

OBSERVATION 72.—*Sarcoma albuminodes.*

A female, 44 years of age, still menstruated but irregularly, had had one child. In her eighteenth year, a moderately hard tumor, of the size of a hen's egg, formed at the lower border of the right mamma, which was treated without avail by leeching, and remained without pain. About the close of February, 1848, the tumor, after more than twenty years' existence, simultaneously with the irregularity of menstruation, commenced rapidly to increase, and now formed a mass the size of a child's head. The nipple was depressed, the integument in some positions firmly attached, immovable, reddened, and pervaded by dilated veins. Upon the pectoral muscle the tumor was movable, and externally it was not lobate, but was circumscribed. Upon puncture, blood only flowed from it. The glands of the axilla not perceptibly swollen. Integument of the body yellowish. Otherwise the functions of the patient were natural. Her mother died, 50 years of age, of dropsy. Her father died over 70 years of age.

The mamma was extirpated July 8, 1848, by Prof. Seutin. It had not grown fast to the ribs. The gland had an irregular, lobulated structure, the lobes being separated by a fibrous tissue, the remains of the lactiferous ducts, but otherwise there was no other trace of the glandular substance remaining. The tumor, with but few vessels, was constituted by a grayish, yellowish mass, almost gelatinoid, or rather firmer and speck-like, and was readily crushed between the fingers. Examined microscopically, it presented a formless blastema, strongly coagulable by alcohol and acids, pervaded by a network composed of isolated flat fibres with irregular contour (not in fasciculi), which were soluble in acetic acid. The fibres branched and formed meshes, in which were deposited, in greatest number, nuclei of $\frac{1}{100}$ mil., spherical, nucleated cells, nucleoli, and sometimes inflammation-globules. The peculiar fibres and nuclei were the predominant elements.

The tumor reappeared in April, 1849, and later increased until it extended into the axilla. The skin ulcerated, and the caustic of Canquoin was applied. Hereupon an eschar formed, and then a gangrenous erysipelas occurred, under which the patient succumbed September, 1849. An autopsy was not permitted.

V. CANCER.

[Cancer, or carcinoma, is a vascular, morbid production, characterized by a form of organic cell, which is peculiar, and never enters as a constituent in any normal tissue. It is

usually deposited in the form of tumors, but occasionally as an infiltration, in any of the organs of the body, and the circumstances which give rise to its development are yet unknown to us.

There are several varieties of cancer, and the physical elements which ordinarily enter into their composition are as follow:—

1. The characteristic cancer-cells, which are spherical, ovoid, irregularly polyhedral, and frequently exhibit caudate prolongations. They average about the .02 mil. in diameter, and possess finely granular contents, with a round or oval nucleolated nucleus as large or larger than a pus-corpuscle. Sometimes cancer-cells are double the ordinary size, or more, and not unfrequently contain several nuclei, or even other cells, constituting parent or endogenous cells.

2. Nuclei, which are spheroid or oval, and resemble those within cancer-cells.

3. Granules, and amorphous liquid or semisolid matter.

4. Fusiform or fibro-plastic cells. These are liable to be confounded with the characteristic cancer-cell, but usually may be distinguished by the smaller nucleus, and the disposition to elongate at opposite extremities, and pass from this condition into the form of bands or fibres.

5. Fibrous tissue; most usually of the white variety, but not unfrequently mingled with elastic fibres.

6. Black pigment in granules, or contained within cells.

7. Fat, in granules, globules, and in the form of adipose-cells.

8. Vessels.

The varieties of cancer are encephaloid, or medullary carcinoma, scirrhus, colloid, melanosis, and fungus hæmatodes.

Encephaloid is that form in which the cancer-cell predominates over every other constituent. Occasionally, the cancer-cells exist in it to the exclusion of all other matters, except liquid, granules, and vessels.

In scirrhus, fibrous matter predominates, and incloses the cancer-cells within the areolæ.

Colloid is composed of a fibrous stroma, with loculi, filled with a gelatinoid matter and cancer-cells.

Melanotic-cancer consists of any of the preceding forms, combined with black pigment.

Fungus hæmatodes is a term applied to an unusually vascular form of cancer, or to any of the other varieties when they are ulcerated and liable to bleed.—Trans.]

Observation 73. Cancer of the parotis. Pneumonia.

A man, 70 years of age, pensioner in the hospital, was examined by me September 9, 1848. Four or five months previously a tumor, the size of a nut, had formed in the position of the left parotid gland, which became hard, painful, and bluish, and then superficially ulcerated. At this time the ulcer presented irregular borders, and from it grew a small cauliflower-like, almost insensible tumor. A fragment of the latter being examined microscopically it was found to consist of simple cells, with single nuclei, measuring, on the average, $\frac{1}{5}\frac{1}{0}$ mil., and fusiform, cell-like fibres. The man died of pneumonia, January 25, 1849, or about 9 or 10 months after the appearance of the former disease. Gray hepatization existed of the lower lobe, and of a portion of the posterior surface of the upper lobe of the left lung, and of the lower and middle lobes of the right lung. Ossifications and atheromatous matter existed in the aorta, which was filled with blood. Liver fatty, granular, and hypertrophied, and the capsule of Glisson was thickened. Gall-bladder distended, with numerous rounded calculi, and projecting for an inch beyond the acute margin of the liver. The kidneys (latterly the patient had had considerable pain in the loins) were filled excessively with blood, which streamed from the incised cortical substance. The tubuli uriniferi were filled to excess with epithelia contained in the turbid urine, which was readily expressed from the papillæ. The parietes of the bladder were thickened, but not cancerous, and the organ contained a turbid urine, in which were suspended epithelial-cells, from the simplest form to the formation of mother-cells. Spleen large and firm.

The diseased parotid was twice the normal size, and, as above stated, was superficially ulcerated, and its lobes were yet partially recognizable. The duct of Steno was closed near its mouth, but was open where it communicated with the gland. Beneath the ulcerated surface the gland was firm, of a cartilaginous consistence, grayish-yellow, and slightly vascular, but centrally it was softened and very vascular and red (central inflammatory softening). The cancerous mass consisted of cells with simple nuclei, which, in some instances, contained carbonate of lime, visible by transmitted light as dark granules (calcification of cancer-cells).

Observation 74.—Cancer of the tongue. A man aged 73 years.

The cancer commenced $7\frac{1}{2}$ months ago upon the back of the tongue, in the form of a wart, and an ulceration extended from the middle to the base of the organ. Death occurred from arterial hemorrhage, at the base of the tongue, 30 hours after its commencement.

Both lungs were firmly attached to the upper ribs, were almost bloodless, and simply emphysematous. Larynx and trachea bloodless. Heart of normal size, but with calcification of the mitral valve, contraction of the left auriculo-ventricular orifice, and calcification of the semilunar valves of the aorta. Arch of the latter dilated, and this to the division into the primitive iliac arteries, with the four cavities of the heart, were filled with soft coagula of blood. Atheroma, with alternating calcification of the aortic parietes.

Liver rich with blood. Left kidney with serous cysts, especially in the cortical substance.

Brain, normal. Pia mater œdematous and several lines thick, but regaining its natural extent upon effusion of the infiltrated serum. Lateral ventricles dilated with serum.

None of the internal organs cancerous; even all the salivary glands being normal.

Upon the back of the first joint of the thumb there existed a tumor the size of a hazel-nut, movable beneath the skin, and surrounded by a richly vascular cyst of areolar tissue. This

tumor consisted of a yellowish-gray mass of a speck-like consistence, and was amorphous without cells.

The cancer was confined to the tongue. The latter, at its tip, was an inch and a quarter thick. The mucous membrane was preserved only at the anterior third of the dorsum, where the papillæ were strongly developed. From the remainder of the surface arose soft, cauliflower-like tumors, rooted in the muscular substance, which, to the inferior surface, was infiltrated by a soft, cream-like matter. The muscular fibres were yet distinct only at the basis of the tongue.

The cancerous mass consisted of cells, among which were distributed unbranching capillary vessels. The cells were as follows:—

1. Simple spheroid, and occasionally polygonal cells, with transparent wall, and some oil-granules in the centre. Size $\frac{1}{37}$ mil. Among them a granular matter.

2. Mother-cells, $\frac{1}{25}$ mil., which inclosed a cell with a darker cell-wall, about $\frac{1}{50}$ mil., containing a nucleus.

3. Large mother-cells, containing ten or more spheroidal cells.

4. Sometimes a cell was visible, recalling to mind the Purkinjean germinal vesicle. It contained a vesicle or hollow nucleus, with a minute oil-globule.

5. Some cells which appeared imperfectly developed.

Observation 75.—Fungus medullaris in the skin, glands, muscles, pleuræ, lungs, trachea, pericardium, and peritoneum, running its course in three months and a half.

A cabinet-maker, 42 years of age, married, always temperate, never syphilitic; about 8 weeks before his entrance (beginning of February, 1848) into the hospital, was attacked by uniformly hard swellings in the right axilla, after which, others of a similar character appeared beneath the skin, upon the pectoral muscles in the vicinity of the mammary gland, and also in the neck. The tumors, the size of walnuts, were rounded, not grown fast to the skin, and readily movable, and had a gland-like appearance. The right arm at the present time was œdematous, and the pectoral tumors the seat of pricking pains. No cough; no fever. Liver normal. All the functions of the bowels normal, except temporary constipation from the use of opium. The diagnosis was uncertain as to whether the case was tuberculosis, cancer, or chronic inflammation of the glands.

February 15. Since several days, there appeared upon the back some tumors the size of a walnut, very hard and very painful, and reddening upon the surface. Great sleeplessness. One of the latter tumors was extirpated for examination. The skin was grown fast to the tumor, and was bluish red. The latter was almost like cartilage, and in section was grayish yellow sprinkled with red. It consisted of cells with simple or rarely double nuclei, and occasionally mother-cells inclosing other cells. Some cells contained numerous fat-globules without distinct nuclei. The cells were spheroid or oval, and had an average diameter of $\frac{1}{50}$ mil. Among them were numerous-inflammation globules. The nearer the tumor approached the cutis, the more the cells of the former resembled the epidermal cells. The cells were inclosed in the meshes of a net, formed of flat fibres.

A pleuritis accompanied by strong dyspnœa, March 5th, put an end to the patient's existence, rendered especially painful from sleeplessness. Before death the œdematous arm had spontaneously opened, and permitted the water to trickle out. Autopsy, 26 hours after death. Size, 5 feet 8 inches. The corpse presented the appearance of a powerful, well-nourished, strongly-built man, without any sign of a dyscrasia. The cancerous tumors, with the exception of one below the left clavicle, were all situated upon the right half of the body. The grayish white cancerous mass now included the mammary gland, skin, and muscles, and so infiltrated them that it presented no defined borders. The skin covering the right half of the sternum, and the true and false ribs of the corresponding side anteriorly and posteriorly, was also the seat of the deposit, several fingers thick, and in many places was very hard, and only occasionally permitted being raised from the cancer-infiltrated muscles beneath. In the latter, the cancer also existed in rounded masses. The right arm was infiltrated with serum, but the veins and arteries were pervious, and only in the axilla a cancerous gland the size of a goose-egg pressed upon the vessels, but even in this position they were not closed by coagulum. The cancerous matter did not penetrate into the ribs or sternum, and these bones were covered by the unaltered periosteum. Upon opening the thorax, the right pleural cavity was observed to contain a quantity of turbid serum, in which were swimming some fibrinous flocculi. A number of cancerous tumors covered the costal pleura from the size of a pea to that of a pigeon's egg. A small number also were upon the pulmonary pleura, which, at the apex of the lung, was attached to that of the ribs. Both lungs contained a very few cancerous masses, about the size of a pin's head, but the substance was healthy, though in the condition of insufflation and not collapsed. Upon the front of the trachea, and embracing both its sides, was a cancerous mass, 150 grammes in weight, extending downwards to the pericardium, but not into it. From the apex of the latter arose another tumor, quite as heavy as the last, and proceeded to the diaphragm with which it had grown fast. The left pleura was healthy. The heart, 350 grammes weight, was healthy, but the four cavities were distended with coagulum, consisting of red-black cruor, and soft fibrine. Upon the mesentery and mesocolon were found a great number (hundreds) of cancerous tumors, from the size of a pea to that of a hazel-nut. They also covered the peritoneal investment of the small and large intestine. The inguinal glands were hard, the size of a pea, and pervaded with cancer.

From all the tumors a milky liquid could be expressed, and with the exception of that upon the trachea, in which softening had already occurred, they were yet all hard (in a crude state).

The microscopic examination furnished the same results as those above mentioned, except that in the more recently-formed tumors the development of the cancer-cells in two

forms could be more distinctly traced. In these, were frequently visible small nuclei, of $\frac{1}{100}$ mil., yet soluble in acetic acid, and adjacent to them others enveloped in a clearer substance (the future cell-wall).

In the second form, nuclei were being converted into vesicles and becoming filled with minute oil-globules, without other nucleus becoming visible, which was only evident in the larger cells.

For the blood of the heart, the blood-corpuscles were well preserved, but in the soft fibrine of its right cavities there existed a large quantity of pale, gray colored, spherical bodies, $\frac{1}{100}$ mil. in size, having a granular surface, and becoming smaller, but not dissolving, in acetic acid. They probably belonged to the cancerous structures.

The above is one of the most acute cases of medullary cancer which I have seen.

Observation 76.—Cancer of the eyeball. February 2, 1848. A boy 12 years of age, the son of scrofulous parents. Earlier, he had suffered from scrofula, and nearly a year ago it was accidentally discovered he could not see with the left eye, and therewith he had hemicranial pain and periodical conjunctivitis, but no pain in the eyeball itself. The strongly injected conjunctiva, however, upon the latter, was painful. Since nine days the eyeball protruded from the orbit, and a kind of fluctuation was perceptible in it; a brown crust covered the cornea, and the sclerotica appeared uneven, as if from the presence of interior tumors. It was extirpated, without the lachrymal gland, which was healthy, by Prof. Uytterhoven. The optic nerve was surrounded by a pale, yellowish and gray, speck-like, varying, soft and hardish mass, which clung so firmly to the bony walls of the orbit that it had to be removed in fragments. Diameter of the eye at the middle of the cornea 36 mil., at its anterior half 16 mil., and at its posterior part 22 mil. Greatest circumference 75 mil. Weight 16 grammes.

The sclerotica was unaltered. The cornea from exudation was considerably thickened, and was perforated at the pupil, and then covered by a brown crust.

The *conjunctiva bulbi* was puffed up, velvet-like, and projected in red pads beyond the cornea.

In section, the eye exhibited the variegated appearance which I formerly described as that of irido-plasma.

The position of the retina was occupied by a gray, brain-like matter, 5 mil. thick at the optic nerve, which had produced the removal of the choroidea, except some portions still visible in thin streaks. The mass extended to $2\frac{1}{2}$ mil. around the vitreous humor in a girdle-like manner to the iris. The latter adhered in lobes to the inner surface of the cornea, and was covered by black pigment. The vitreous humor was converted into a very yellow firm mass, in the anterior surface of which the soft, green crystalline lens was visible. The optic nerve throughout was fibrous and without a trace of nerve substance.

The gray brain-like substance was pervaded by occasional varicose capillary vessels, and consisted of a finely granular mass, with numerous, almost spherical, smooth or granulated nuclei, the $\frac{1}{200}$ mil., which decreased in bulk in acetic acid. Rarely cells the $\frac{1}{50}$ mil. with simple or compound nuclei were mingled with the former.

Acetic acid rendered the mass gelatinoid, and alcohol coagulated it strongly.

The same element was found in the vitreous humor, the color of which depended upon intermingled coloring matter of the blood, which disappeared by treating with water.

The crystalline lens presented itself in fibres resolvable into granules with intermingled black pigment. It also contained isolated nuclei. The capsule was normal.

The mass surrounding the optic nerve consisted of numerous large nucleated cells.

The boy left the hospital February 4th.

March 20. The cancerous mass again began to grow forth. On May 19, I saw the patient, when he was lying in bed in a soporose condition. From the orbit operated upon there grew forth a red bleeding fungus the size of a hen's egg. The right eye was amaurotic, the pupil dilated, and the iris immovable. Earlier, he had earache upon the right side, and formication in the extremities. The pulse was slow and small. He answered incoherently. Shortly after the patient died, but an autopsy was not permitted.

Observation 77.—Cancer of the face. Patient, a female 70 years old. Death from peritonitis. Lungs healthy. Ossification of the coronary arteries of the heart; thickening of the mitral valve; calcification in the aorta and its semilunar valves. Liver fatty; fibrinous exudation upon the peritoneal investment of the small intestine; and small, isolated ulcers within the latter. Cancer in none of the internal organs.

The cancer in the face had destroyed the upper lip entirely, a portion of both cheeks, the cartilages of the nose, and the lower eyelids, so that the face formed one large, hideous ulcer, without the bones having been involved. Upon the skin of the forehead only was the cancerous mass, in the form of a speck-like deposit, the size of a walnut, which was not yet softened. This consisted of smaller portions, and was distinguished by its great vascular poverty, and was composed of spherical cells with sparse mother-cells, and still fewer fusiform fibres.

Observation 78.—Cancer of the œsophagus in a man. Calcifications in the aorta; serous cysts in the left kidney; small, soft elevations in the mucous membrane of the œsophagus, extending several inches from the cardiac orifice, but not below it, producing narrowing. Upon the peritoneal covering of the stomach a small cancerous tumor, the size of a nutmeg. Cancer in no other organs.

Observation 79.—Simple cancerous ulcer. A man, perhaps 50 years old, formerly a soldier, for a long time had an ulcer upon the leg, produced by caries of the tibia. The leg was amputated, the wound healed, and, after a few months, a new ulcer formed upon the stump, which rendered amputation at the thigh necessary. The wound cicatrized, and now a large ulcer formed in the inguinal region of the same side, so that, about a year and a half after I had examined the granu-

lations, which formed in this ulcer, the patient died from exhaustion.

Autopsy.—Double pleuritis; both pleuræ filled with pus, but breast in the right. No tubercles in the lungs, which were feebly attached to the ribs at their apex. Heart small, 250 grammes. Liver very much softened, fatty, 1500 grammes heavy. Kidneys very yellow-colored, fatty. Spleen normal. The femoral artery, almost to the end of the stump, was not closed; and the extremity of the os femoris, at the entrance of the medullary canal, was covered by a fibrous membrane, but the cavity itself was not closed. In none of the organs was there a trace of cancerous deposit. In the ulcers, at no time, had cancerous matter been found; but, nevertheless, they did not heal under the most restorative treatment, and a new ulcer formed when the first was removed by amputation.

Observation 80.—Cancer of the uterus. A female, 46 years of age. The greatest portion of the uterus was destroyed, and formed, with the perforated rectum, a cloaca. A portion of the fundus uteri was well preserved, not hardened, gray-yellowish, and not reddened. The neck of the uterus was converted into a stinking, greenish mass without cells. Only in another portion of the fundus, and in the thickened vagina, were observed cells with a nucleus and oil-globules, from the $\frac{1}{100}$ to the $\frac{1}{75}$ mil., and occasionally mother-cells elongated at two ends into fibres the $\frac{1}{25}$ mil., and inflammation-globules.

Liver hypertrophied, granular, fatty.

Heart small, with the left ventricle contracted.

Cancer in no other organs.

Observation 81.—Scirrhus of the submaxillary gland. Male patient, 62 years of age. He was examined December 5, 1847. The tumor occupied nearly the position of the left submaxillary gland, and, although it was of the size of a hen's egg, it was not decidedly circumscribed, and was applied upon the lower jaw; but, nevertheless, a considerable swelling near the frænum linguæ rendered it pretty safely conclusive that the gland was involved in the degeneration. Below the lobe of the ear was a hardened lymphatic gland. The opening of the mouth was possible to a small extent only. There was little pain. Death, February 5, 1848, from pneumonia and gray hepatization of the lower lobes of both lungs. A single hard yellowish knot, the size of a pea, was found upon the right pleura pulmonalis. The tumor weighed nearly 150 grammes, occupied exactly the position of the submaxillary gland, and was grown fast to the periosteum of the horizontal ramus of the lower jaw, which otherwise was unaltered. It extended a short distance among the tendons and muscles attached to the base of the lower jaw, and pressed upon the facial artery, which, however, remained pervious. The skin covering the tumor had grown fast to it, but was not inflamed. In the middle of the tumor were several cavities the size of a hazel-nut, filled with a puruloid matter. These cavities were the dilated ducts of the glandular lobuli, as was plainly indicated by the introduction of a fine probe.

The liquid consisted of epithelial cells filled with oil-globules, the latter isolated, cancer-cells, and cholesterine crystals.

In some places the tumor presented the acinose structure of the gland, as in the vicinity of the duct of Wharton, yet quite distinct, and this possessed the normal terminal vesicles; but the remainder of the substance was of a cartilaginous hardness, gray-yellowish, and consisted of rounded nucleated cells, from $\frac{1}{100}$ to $\frac{1}{75}$ mil. (whereas, the terminal vesicles of the normal gland were $\frac{6}{100}$ mil. broad, and were covered upon their inner surface with granules), isolated cells without nuclei, and rarely fusiform cells and fibres.

The above-mentioned swelling at the frænum linguæ, which I mistook for the dilated duct of the scirrhous gland, was produced by the sublingual gland, which was healthy, being pressed upward by the tumor.

Observation 82.—Scirrhous tumor in the areolar tissue of the mammary gland. Patient a female, 50 years of age. The tumor existed since six years, and originated near the unaffected gland. It was constituted of a pale adipose tissue, pervaded by tendinous-like fibres, from which a faintly whitish liquid could be scraped, and was not areolar, although small yellowish granulations the size of a pin's head, and easily separable from the surrounding substance, were observed (perhaps about ten in the section). The granulations in section presented a fine opening, apparently of a vessel, and consisted of an exudation which was nucleated, and occasionally, yet distinctly, red-colored. The liquid expressed from the tumor contained nucleated cells the $\frac{1}{100}$ mil., and the solid matter was striated or banded like coagulated fibrine, and inclosed the cells.

Observation 83.—Cancer of the pylorus. Tubercles in the lungs. Hypertrophy of the intestinal villi. Peritonitis. Osteitis. Hernia. Cysts in the broad ligaments of the uterus.

Patient a female, aged 69 years. Five months since she was operated upon for crural hernia, and the last six days she suffered alone from vomiting, and then died. The autopsy presented the following: Beneath the right crural arch, after death, a new but unaltered portion of intestine had protruded. Below the left crural arch was formed a cyst, the size of a walnut, with thickened walls, which constituted an old hernial sac yet communicating with the abdominal cavity, and was filled with serum, and had a portion of omentum attached firmly to its bottom.

In the peritoneal cavity there was much pus, and the transverse colon was pressed deeply into the pelvis by the stomach dilated to double its usual size, and filling up the umbilical region. The anterior face of the stomach was covered by a firm pseudo-membrane, which had prevented penetration of the very soft coats in this position. At the pylorus, the muscular and fibrous coats of the duodenum were considerably thickened. The former contained no abnormal exudation, but was hypertrophied only, the latter was speck or fat-like, gray yellowish, and exuded upon pressure a milky liquid, consisting of simple nucleated cells. In advance of the thickened mucous membrane of the duodenum arose soft, gray, rounded

tumors, dotted with red blood-points, which projected into the stomach. In this position the villi were hypertrophied to double the length, as distinguished by the microscope, and the cylindrical epithelia also were double the normal size.

The sternum was softened, filled with an excess of blood, and exhibited its bone-corpuscles enlarged and containing numerous pus-corpuscles.

The apex of the lungs contained numerous soft tubercles, the size of a pin's head, surrounded by black pigment. Liver fatty. Kidneys small and anemic. Uterus and ovaries healthy, but in the broad ligaments were two cysts, one the size of a goose-egg, and consisting of several divisions, the other the size of a walnut. Both contained a transparent, somewhat yellowish serum. The membrane of the cysts was composed of two layers.

Observation 84.—Cancer of the œsophagus. Calcification of cancer-cells. Atrophy.

A female, 75 years of age, whom I saw shortly before her death, about six weeks prior, was attacked from time to time with difficulty of swallowing through the œsophagus, so that solid food sometimes would not pass, but be rejected, while a sound could be readily introduced into the stomach. The corpse was very much emaciated. All the organs were atrophied.

Height 4 feet $2\frac{1}{2}$ inches. Weight of cerebrum 1070 grammes; of cerebellum and pons 190 grammes; heart 130 grammes; liver 670 grammes. Breadth of latter 170 mil.; antero-posterior diameter of right lobe 134 mil.; circumference of do. 300 mil.; antero-posterior diameter of left lobe 90 mil.; circumference of do. 200 mil. Weight of each kidney 70 grammes; of the spleen 30 grammes. Both lungs exhibited at the apex calcified miliary tubercles, surrounded by condensed melanotic tissue, and in one there was a small cavity. Upon the cardiac portion of the stomach there was deposited beneath the peritoneum a glandular-looking body, the size of a walnut, inclosing a dry, yellowish, mortar-like matter. This was a calcified cancerous tumor. The inner surface of the œsophagus from its commencement to the cardia was covered with yellowish white, wart-like prominences, which extended into all its coats except the outer tunic. They were very numerous, and although at the lower extremity of the canal they grew out in a cauliflower-like manner, yet they narrowed it only inconsiderably. By incision, the mucous and fibrous coats of the œsophagus were observed to be infiltrated with a cream-like matter, consisting of simple and mother cells.

In no other organ was cancer found.

Observation 85.—Cancer of the œsophagus.

A man, 45 years of age, since six months commenced to suffer difficulty in swallowing, which appeared to arise from an obstruction in the œsophagus, as a sound would not pass. The voice became hoarser, and fourteen days before his death was hardly audible. Even in taking liquids, when these arrived in the œsophagus a gurgling noise was heard, coughing was induced, and the liquids were rejected. The patient died of exhaustion.

Autopsy.—Great emaciation of the corpse.

At the position of the thirteenth cartilaginous ring of the trachea, and communicating with this to which it had grown fast within the œsophagus, was a rounded ulcer, half an inch in diameter, with hard, gray-yellowish, callous edges. Upon the mucous membrane of the œsophagus, and pervading all its coats, was found a hard, yellow-gray matter, which, at one place, externally upon the œsophagus, formed a tumor the size of a nut. (The sound and food, in this case, had evidently entered the trachea through the perforation.)

Some of the tracheal glands were infiltrated with melanosis. The mucous membrane of the trachea was injected, softened, and covered with a puruloid, frothy liquid. In several positions, but more particularly in the apex, the left lung contained small cavities filled with a fetid ichor, with fragments of the pulmonary parenchyma. (These were abscesses determined mechanically by the introduction of foreign matters into the bronchia in the act of swallowing.) There was no trace of tubercle in the left lung, except a single one, which was calcified. At the base of the lungs was inflammatory engorgement, with inflammation-globules.

All other organs were healthy.

The cancerous matter of the mucous membrane was amorphous, or striated and fibrous, with some single, imbedded spherical nuclei. From the external tumor of the œsophagus, but not from its coats, a cream-like liquid could be expressed, which contained cells from $\frac{1}{50}$ to $\frac{1}{25}$ mil. These were simple cells, with a nucleolated nucleus, or more frequently elliptical parent-cells with band-like prolongations, or they were spherical. Two to four cells were contained in the mother-cells eccentrically, or almost filled these up. The cell-wall dissolved slowly in acetic acid, allowing the nucleus to remain.

The course of development of these cells was very evident: Upon the œsophageal mucous membrane was a cytoblastema with nuclei, and upon the exterior of the œsophagus perfectly developed cells.

Observation 86.—Cancer. Medullary fungus of the omentum majus, of the mesentery, and of the peritoneal investment of the intestines and ovary, in a female 52 years of age. The tumors of the omentum were rounded, and were distinguishable by the feel through the abdominal parietes. The coats of the stomach, excepting the mucous membrane, were hypertrophied. A few medullary cancers were in the liver. The left ovary formed cysts, in which was deposited medullary cancer, and a similar degeneration had commenced in the right ovary. The parietal peritoneum was covered with inflammatory exudation, which had formed laminæ and fibres.[1] Brain, lungs, and heart healthy.

Observation 87.—Medullary cancer in the lobulus spigelii of the liver, and in the mesenteric glands, in which latter there was effusion of blood. Villus-like growths in the pylorus. Patient a male, 47 years of age.

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[1] It is a pure hypothesis, that exudation after inflammation in medullary cancer conducts itself in another relation than in inflammation under ordinary circumstances.

There were no cells in the medullary cancer of the glands, and in the liver the cancer-cells had the form of the hepatic cells. The spleen weighed 30 grammes.

OBSERVATION 88.—Medullary cancer, with melanosis infiltrated in the liver. Conversion of the blood into melanosis. Degeneration of tubercle.

December 8, 1848. A female nurse, 48 years of age, complained of illness for the last six months. She had painful tumors, distinctly perceptible to the feel, in the very much enlarged and hard liver. No jaundice. She had ceased to menstruate.

February 15, 1849. Since some days the urine was yellowish colored and turbid; the feet were œdematous, and ascites had occurred, with the development of which the pains ceased. Death, February 29. Autopsy 24 hours afterwards.

Cerebellum softer than the cerebrum. Little serum in the ventricles. At the apex of the lungs were some calcified tubercles, the size of a pea. (The daughter of this woman suffered from tuberculous phthisis in the same hospital!) Heart very soft, yellowish colored, infiltrated with fat, weight 190 grammes. The left ventricle was 16 mil. thick; the right, 4 mil. Length of the heart 80 mil.; breadth, 55 mil. Externally, this organ was not covered with fat. Mitral valve thickened by the presence of some spots of atheroma. Spleen firm, 200 grammes weight. In one ovary was a serous cyst, the size of a walnut. Kidneys and intestines healthy. Liver 6500 grammes weight. The vena porta, so far as its branches could be followed, was filled with blood-clots firmly attached to its walls, and the same condition existed in the vena cava at its passage from the liver. The hepatic artery and ductus choledochus were free.

The surface of the liver was smooth, brown-yellow marbled, not rugged, and rather firmer than normally. It extended even into the inferior pelvis. The capsule of Glisson was thickened. The interlobular substance appeared normal, and the bile-ducts were free. Besides some effusions of blood in the middle of the hepatic tissue, two substances could be distinguished, one brownish-red passing to brownish-black; the other pale-yellow. The latter, in some instances, formed islets, $\frac{1}{4}$ to 3 mil. diameter, in the brownish-black substance, and at other places it prevailed so that this formed islets $\frac{1}{4}$ to $\frac{1}{2}$ mil. in it. The brown substance was soft; the yellow firm, like fibrous tissue. In section the latter was granular, and at the surface of the liver consisted of hepatic cells with fat-globules. Where the yellow substance was firmly associated in the middle of the liver, there appeared a striated tissue inclosing numerous spheroidal or polygonal cells, from the simplest form approaching the hepatic cells to mother-cells. This was an infiltrated form of medullary cancer. The cells were mostly $\frac{1}{100}$ to $\frac{1}{55}$ mil. long, by $\frac{1}{200}$ mil. broad.

In the brown substance was much pigment with fat-globules, sometimes inclosed in cells. The cells, filled with melanotic granules, insoluble in mineral acids, measured $\frac{1}{100}$ of a mil. in diameter.

In the blood-coagula of the vena porta, the transformation of blood into pigment, insoluble in mineral acids, could be very satisfactorily traced. See the figure.

VI. ENTERITIS. TYPHOID. SCARLATINA. GLANDERS. DEGENERATION OF CANCER.

OBSERVATION 89.—Enteritis. Cicatrices after typhoid. Apparent fungus medullaris of the mesenteric glands. Stearosis of the kidneys and liver.

A man, 20 years of age, six weeks before his death had passed through a course of typhoid, of which he recovered in three weeks. Since some days he suffered from continued vomiting and diarrhœa. Autopsy, 24 hours after death. Height of body, 5 feet 7 inches. Brain hyperæmic. Lungs healthy, without a trace of tubercles. Heart 200 grammes weight. Spleen firm, 170 grammes. Both kidneys, 350 grammes. Liver, 1750 grammes.

Cortical substance of the kidneys yellowish; medullary substance red; external surface somewhat elevated, granular; tubuli uriniferi abounding with fat-globules.

Liver granular; hepatic cells filled with fat; pancreas healthy.

Gastric mucous membrane not softened; covered with ecchymoses, in some instances surrounded by a vascular corona.

Intestinal mucous membrane only in some places injected, otherwise pale and covered with an exudation, giving it a felt-like appearance. The latter, consisting of pale nuclei, inflammation-globules, and an amorphous substance, which so enlarged the villi that these measured from $\frac{1}{2}$ to $\frac{3}{4}$ of a mil. in diameter (instead of $\frac{1}{4}$ of a mil.). Hence the peculiar appearance of the mucous membrane, resembling coarse gray felt. The latter membrane, also, was much softened, and the submucous tissue was hyperæmic.

The cicatrization of the typhoid ulcers appeared in two forms:—

1. In the lower part of the small intestine, as shallow depressions, over the borders of which the newly produced mucous membrane extended; and,

2. In some positions as contracted, stellate or radiate scars, produced by approximation of the edges of the mucous membrane.

The large intestine was healthy.

The mesenteric glands formed from 20 to 30 milk-white tumors, from the size of a small bean to that of a hazel-nut, from which could be expressed a semiliquid milky matter, having so much the appearance of medullary cancer, that I took it for such until examined by the microscope, when it proved to be merely a purulent infiltration of the glands.[1]

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[1] Whether such cases have served as a basis to the opinion that medullary cancer frequently forms after typhoid, I cannot decide. Until now, I have never seen medullary cancer developed after typhoid.

Little fibrinous exudation upon the peritoneum.

Observation 90.—Typhoid fever, since ten days.

A young woman, of 17 years. Height, 5 feet 1 inch. Heart flaccid, 250 grammes weight. Lungs infiltrated with red serum, and retaining the impression made by the finger; weight of both 1150 grammes. Liver 1250 grammes weight. Spleen normal in consistence, 200 grammes weight. Glands of the mesentery much swollen. Many of the glandulæ solitariæ in the small intestine were enlarged to the size of a pea, and were hard and infiltrated with a firm yellowish matter. Numerous plaques of Peyer, surrounded with a corona of vessels, and covered by their villi and epithelia, presented a uniform velvety appearance arising from the glandulæ and the Lieberkuhnian follicles being infiltrated. The submucous cellular coat was not thickened.

A single plaque of Peyer, in the vicinity of the ileo-cæcal valve, was superficially ulcerated.

Observation 91.—Typhoid fever at two different periods.(?) Pancreatitis.

A boy, 14 years of age, who, according to the evidence of a brother and sister, both ill of typhoid in the hospital, had been unwell for three weeks, was received in the hospital, and eight days afterwards died.

Brain very tough. Lungs and heart normal. Kidneys hyperæmic. Liver fatty, 1000 grammes in weight. Pancreas hard and firm as cartilage. Although the glandular vesicles were distinguishable beneath the microscope, yet the division of the lobules was hardly perceptible. They were united by a firm exudation, occasionally converted into fusiform fibres. The glands of the mesentery were enlarged to the size of an almond. Spleen firm, dark red, 120 grammes weight. Near to, and above the ileo-colic valve for some inches, were glandular plaques covered with a yellowish crust several millimetres thick, in the centre of which small fragments had been cast off, leaving the cellular coat exposed. Between these were some solitary glands with the mucous membrane entire. Higher in the ileum appeared alveolar plaques, in the alveoli of which were yellowish crusts, and most remote from the ileo-colic valve were mere reticular plaques, in which the position of the glands of Peyer were indicated by puncta. In this case, it was evident the deposition occurred either at two periods, of which those plaques near the ileo-colic valve belonged to the second, and those which had first escaped were afterwards attacked, or there had occurred an abnormal course of development; instead of the infiltration having taken place first near the ileo-colic valve, as commonly, and then been thrown off, it is possible that, as an exception, the reverse may have happened. The first view, however, is the most probable.

Observation 92.—Scarlatina.

A girl, 13 years of age, ill the last five days. The body, except the face, was yet covered with spots of scarlatina. Death, without previous diarrhœa, after remaining 24 hours in the hospital. Brain normal; lungs normal (the right one weighed 220 grammes); heart 150 grammes—all its cavities filled with dark liquid blood, without a trace of coagulum. The blood in the veins was in the same condition. Liver pale-yellow, 1000 grammes weight. Kidneys, of which the right was 80 grammes, hyperæmic, with many small ecchymoses in the cortical substance, and the medullary substance red in color. The tubuli uriniferi were in the commencement of exfoliation of the epithelium, and were filled with nuclear structures.

No hydrops, and no œdema. Spleen of normal consistence, 120 grammes weight. Small intestine, with a yellowish liquid contents. Near the ileo-colic valve were four plaques of Peyer, with an areolar appearance, the glandulæ being burst. Between them some of the solitary glands were swollen to the size of a small pea, and these were very numerous in the large intestine, and were burst open, or were filled with a whitish liquid.[1] There were also some isolated vascular areolated surfaces between the glands. The latter burst or became considerably lessened in their circumference after a few hours. The coats of the intestine were unusually easy to separate from one another. The gastric mucous membrane in the *cul-de-sac* was thinned, softened, and strongly injected, with interspaces, colored reddish-brown or blackish.

Observation 93.—Hydrops hæmorrhagicus of the bursa mucosa of the patella.

A farmer, 62 years of age, since three years remarked a tumor on the right knee. When I saw him, the knee was bent, and in front of the patella was a fluctuating tumor the size of a child's head. The condyles of the os femoris appeared swollen. As it was readily determined that the tumor lay in front of the patella, and had no communication with the articulation, but was evidently seated in the bursa mucosa, an incision was made into it, from which a bloody serum and a large quantity of very hard, mahogany, brownish-red colored coagulum was emptied. The latter consisted of fibrinous lamellæ, covered with fat-globules and pale blood-corpuscles. After the matter had been emptied, the unaffected patella was exposed. The wound healed after the operation (May 22), until it was an inch in length, and covered with granulations, when the patient suddenly died on the 26th of June. The knee-joint and bones were quite healthy, and the skin only was considerably thickened, and thus the diagnosis was confirmed. With the exception of a large quantity of serum in the brain, and a considerable degree of softening of the fatty heart, and some old pseudo-membranes upon the pleura pulmonalis, the organs of the body presented no alteration from health.

Observation 94.—Gangrene from closure of the arteries after typhoid. New formation of bone around a sequestrum.

A female, 21 years of age, who had got well from typhoid with pneumonia, treated by twice bleeding, was attacked with gangrene of the right leg. Skin, muscles, and nerves were almost entirely destroyed by moist gangrene, and the tibia lay bare The bones were sawed off in the gangrenous place, but the patient afterwards died. Height, five feet. Pleuritis,

[1] This swelling is frequently found in scarlatina. Similar to what occurs in cholera, we find here an augmented secretion, which is not emptied from the glands.

with chocolate-like purulent effusion, which had caused the lungs to collapse. Heart firm, and containing a little fluid blood. The origin of the aorta was two inches in circumference, and at its division into the iliacs one inch. Beneath the aortic valves were some atheromatous spots. The right iliac artery, from its commencement to Poupart's ligament, was filled with a coagulum, at first soft, then firm; after which, for two fingers-breadth, the femoral was free, and was then alternately closed with coagula, and free down to the knee. The branches of the latter vessel, also, for the most part, were filled with coagula. Their diameter was lessened, so that the commencement of the femoral artery was only three mil. in diameter. These vessels, however, were not entirely closed. The coats of the arteries throughout were thickened. The vena portæ and vena cava were free. The external iliac and femoral veins of both sides, with most of their branches, were firmly closed by coagula, and their coats were occasionally thickened. Both extremities were œdematous. The skin of the right leg appeared infiltrated, and the muscles converted by exudation into a gray-yellowish, fat-like mass, containing serum. Succeeding the latter was a cartilaginous substance, and then a rugged shell of bone resting upon the periosteum of the stump of the tibia, around which it was deposited, and sent processes into the surrounding muscles.

Upon the fibula were osteophytes. The bones were necrosed. The bone formed around the tibia extended nearly to the knee-joint.

The liver was straw-colored, homogeneous, fatty, 1750 gram. weight. The spleen was firm, 250 gram. The right kidney was 130 gram. The intestine presented the traces of healed typhoid. All the viscera were pale and bloodless.

Observation 95.—Glanders in man.

A soldier, 28 years of age, suffered, 10 years ago, bronchitis. After attending horses with glanders, he became again ill, the 16th of April. Headache, stitch in the side, cough, fever, great prostration, dyspnœa, eruption of suppurating pustules upon the skin, on the 24th, and death upon the 29th.

Meninges injected. Upon the Schneiderian membrane of the septum nasi in the right nostril was a funnel-shaped ulcer about the size of a pea, with elevated edges. Little soft coagulum in the heart, and in the jugular vein a plug of pus in the centre of a blood-coagulum. Pseudo-membranes upon the left pleura.

Distributed in the lobes of both lungs were about twenty swellings from the size of a pea to that of a walnut, immediately covered by the pleura, or distant from it, which consisted of hard or diffluent plugs of pus.

Mucous membrane of the larynx, trachea, and bronchia strongly injected. Upon the tracheal mucous membrane were scattered yellowish hardish knots the size of linseed, difficult to detach, and consisting of granular exudation. Liver rich in blood, and its serous investment thickened. Kidneys normal, and their pelvis filled with turbid urine. Spleen enlarged doubly, diffluent, in some places infiltrated with distinct pus ichor.

Gastric mucous membrane in the *cul-de-sac* with strong venous congestion, softened; that of the large intestine quite as red, but nowhere ulceration. Mesenteric and inguinal glands swollen. Veins of the pelvis and lower extremities filled with liquid blood.

Skin of the neck, breast, abdomen, back, and extremities covered with numerous reddish-brown crusts, beneath which was a liquid pus ichor extending into the cellular tissue, and even into the muscles, and not circumscribed. Some isolated pustules filled with ichor were yet preserved.

Observation 96.—Fibrous degeneration of cancer.

Preliminary Remark.—In my treatise upon cancer, I have not spoken of its degeneration or retrogradation, because I could not support, by my own experience, the careful researches first made on this subject by Oppolzer and Bochaldek,[1] and was convinced that, since then, incipient cancer has sometimes been taken for cicatrices of the same. This, for instance, has happened in scirrhus of the mammary gland, where the drawing in of the nipple, produced by atrophy from the deposit of a cancerous matter, often amorphous, has been presented as the commencing formation of a cicatrix. Quite as little is the known umbilical contraction in cancerous tumors of the liver always a sign of retrogradation; on the contrary, it occurs also in the first stage, when the new deposit produces atrophy and sinking of the normal tissue. From my own observations, I am acquainted only with the conversion into calcareous matter of cancerous tumors, by the deposit of calcareous earth in the cells and in the cancerous tissue (see Pl. VII.), and of a partial fibrous degeneration of cancerous tumors, of which I will impart an example. An entire spontaneous cure, as is frequent in tubercle, I do not deny, but until now I have never seen one.

A soldier, 22 years of age, had been in ill health for a year, but had performed duty until October 16, 1849. Earlier, he had suffered several times with intermittent fever. October 16th, he entered the hospital on account of a swelling of the glands on the right side of the neck, which were of the size of a bean, and soft, and had existed already a long time. The 19th, fever and vomiting came on, which, with diarrhœa, dyspnœa, and symptoms of peritonitis, continued until death, November 20.

The heart contained no coagula.

In the liver were numerous yellowish-gray tumors, of cartilaginous hardness, not regularly circumscribed, but well defined in color from that of the normal hepatic substance. They existed upon the surface, where they were prominent and presented no umbilical depression, and also interiorly. In the latter position, they were deposited around the large branches of the vena portarum, with the walls of which exteriorly they were firmly grown. These tumors, upon scraping, gave only a clear serum, and consisted of fibres with nuclei from $\frac{1}{125}$ to $\frac{1}{100}$ mil. and minute molecules. The fibres

[1] Compare also the researches of Virchow, in his *Archiv*, and Albers, in the *Rheinischen Monatschrift*, 1848.

were cylindrical or flattened, and branched. They gave no gelatine on boiling, and little albumen and fat, and reacted like coagulated fibrine. Near these were some tumors which were softer, and, by scraping, yielded a milky liquid, which consisted of strongly albuminous serum, nuclei, and cells. These tumors also already contained fibres, but in inferior quantity, fusiform and isolated.

Similar tumors, partly exhibiting yet fresh medullary cancer and partly complete fibrous conversion were found in the lungs, bronchial glands, upon the stomach, and in the glands of the mesentery, and along the course of the abdominal vessels. In the latter, a loose fibrous capsule invested the evidently lessened and contracted fibrous tumors.

Soft medullary cancer, consisting of albuminous serum and cells, was infiltrated in the pancreas, spleen, and kidneys, also within the considerably dilated ductus thoracicus, and several other dilated lymphatic vessels of the intestines and pelvis. The lymphatic glands of the neck were infiltrated with soft medullary cancerous matter. It is to be remarked, that even in the soft medullary cancers, liquid albumen and fat were in much less quantity than usual.

At the apex of both lungs were some dried tubercles.

EXPLANATIONS OF THE PLATES.

PLATE I.

TRANSFORMATION OF THE BLOOD; INFLAMMATION-CORPUSCLES;[1] PUS.

(WHERE NOT OTHERWISE SPECIFIED, THE FIGURES ARE REPRESENTED MAGNIFIED 255 DIAMETERS.)

FIG. 1 (see Obs. 53) illustrates the origin of inflammation-corpuscles from blood-corpuscles. From the reddish coagulum of the femoral artery of a gangrenous foot. The inflammation-corpuscles here consist of groups of blood-corpuscles, retaining their red color, but diminished in size, held together by means of a coagulated albuminoid mass, but not invested by a cell-wall, *a*. Acetic acid does not dissolve the corpuscles, but renders them paler only; concentrated nitric acid does not alter them. In the middle of the coagulum was found a whitish, flowing puruloid mass, consisting of minute fibrinous molecules, fat-granules, and inflammation-corpuscles, *b*. The hematine is here represented as having escaped from the altered blood-corpuscles and infiltrating the connecting substance of the inflammation-corpuscles.

Fig. 2. From red softening of the brain, of a woman of 60 years of age, after apoplexy. In this figure, besides fragments of nerve tubuli, are represented inflammation-corpuscles (*b*), still red in color; irregular groups of blood-corpuscles diminished in size (*a*), the color of which has been altered by acetic acid; and inflammation-corpuscles, which are colorless, and consist of fat-granules united by fibrine (*c*).

Fig. 3. (See Obs. 93.) Laminæ of fibrine or flakes from a hemorrhagic hydrops of the bursa mucosa of the patella.

Fig. 4. Commencing splitting of fibrine, and formation of cleaving fibres in a false membrane.

Fig. 5. Inflammation-corpuscles from the blood of a vein.

Fig. 6. Inflammation-corpuscles from the blood of an artery. This and the former vessel were closed by a coagulum of blood which adhered firmly to the sides, in a case of typhoid. (See Obs. 94.)

Fig. 7. Analogous structures to the inflammation-corpuscles, from the first layer of the future germinal cell from the ovary of a bird. (Compare also Fig. 19, Plate II.)

Fig. 8. The same as Fig. 7, from the germinal vesicle of an unfecundated ovum of the frog.

Fig. 9. A capillary vessel with a fusiform dilatation from the mesentery of a freshly killed frog.

Figs. 10, 13. (See Obs. 39.)

Fig. 10. A vein *a*, *b*, laid open, which had grown fast to the artery *ar*, *ar*, and whose caliber was obstructed by a coagulum of blood *c*, in the vicinity of a pair of valves. The inner surface of the vein *v*, *v*, beneath the coagulum, was rough, and covered with flocculi consisting of pus-corpuscles and fat-granules.

Fig. 11. Pus-corpuscles united together so as to form a false membrane. From the surface of the lungs.

Fig. 12. A portion of a membranous layer, consisting of pus-corpuscles, from a vein. They are mingled with fat-granules, and contain nucleoli the $\frac{1}{200}$ of a millimetre in diameter. Magnified 550 times.

Fig. 13. Illustrates the formation of pus-corpuscles. *a*, represents a portion of fibrine, from a blood-clot taken out of a vein, which had broken down into small granules or nucleoli, not yet enveloped with the nuclear layer. *b*, represents perfectly formed pus-corpuscles from the same coagulum. This observation gives a correct idea of the origin of pus-corpuscles in the blood.

Fig. 14. Mucus. From a slight bronchial catarrh. One of the cells is filled with fat-granules, and the lowest in the figure had commenced to fill with the same. The other bodies

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[1] In this and the next plate, inflammation-corpuscles are represented, as they occur in blood within the bloodvessels, and in exuded plasma. I have already given the reasons why I consider these as an advance towards cell-formation and not a retrogradation of cells. That all epithelia, wherever they may occur, and all pathologically formed cells can become infiltrated with fat I grant, but, notwithstanding the valuable researches of Reinhardt (in Virchow's *Archiv*, vol. i.), I am not convinced that in blood, as in exudation, the globular masses do not, like the cleavage globules, originate by aggregation and the later development of a cell-wall as well in the former as in the latter. This mode of origin occurs, without doubt, in softened cerebral substance, atheroma, &c., in which there can be no pre-existing cells to account for the inflammation-corpuscles, and these are entirely too large to be considered as colorless blood-corpuscles infiltrated with fat.

imbedded in the amorphous mucus are nuclei of the future epithelial cells, with the nucleoli hardly distinguishable.

Fig. 15. The same mucus-corpuscles treated with acetic acid, by which the nucleoli have become visible, and the nuclear layer dissolved.

Fig. 16. Mucus-corpuscles rendered more translucent by acetic acid, so as to make the nucleoli more visible, which readily takes place, because the nuclear layer is more slowly dissolved in these than in pus-corpuscles. Magnified 400 times.

Fig. 17. Normal pus-corpuscles. *a.* Examples with from 3 to 5 nucleoli. *b.* Others treated with acetic acid; the outer or nuclear layer dissolved, and the nucleoli remaining with a central depression. *c.* Pus-corpuscles with from 1 to 7 nucleoli. That containing a simple nucleolus has this covered with minute granules. Magnified 400 times.

Fig. 18. Pus-corpuscles and inflammation-corpuscles from inflamed ovarian cysts containing colloid. *a, a.* Inflammation-corpuscles. *b, b.* Pus-corpuscles with simple or compound nucleoli. Magnified 400 times.

Fig. 19. Artificially-formed cells from the addition of a few drops of sulphuric acid to an albuminous bile from a case of cholera. These bodies resemble pus-corpuscles, and consist of resinous nucleoli, surrounded by a layer of coagulated albumen.

Fig. 20. Tubercle-corpuscles from the lungs. They are irregular nuclei containing nucleoli. Among them are minute elementary granules, which become nucleoli. Magnified 400 times.

Fig. 21. Represents the calcification of tubercle. *a.* Tubercle-corpuscles and nucleoli infiltrated with carbonate of lime, and appearing dark from being viewed by transmitted light. *b.* The same corpuscles, after the carbonate of lime is dissolved out by muriatic acid. The tubercle-corpuscles have preserved their form, and have become only more pale.

Fig. 22. Typhoid-exudation from the intestinal glands.—Granules and nuclei, with nucleoli, of irregular form. Magnified 400 times.

Fig. 23. Pus-corpuscles, with indistinct nucleoli; pyoid-globules. Magnified 255 times.

Figs. 24, 25. Pus-corpuscles, from an abscess of the skin. The pyoid-corpuscles have merely a finely granular surface. Nucleoli rarely occur so compound as represented in figure 24. These constitute the transition form to inflammation-corpuscles. Magnified 400 times.

Fig. 26. Pus-corpuscles treated with acetic acid; the investments almost entirely dissolved, and the nucleoli generally continuing associated, remaining behind. The minute dot in the centre of the nucleoli is a depression, and not a granule within.

Fig. 27. Inflammation-corpuscles, from the inner surface of the uterus. Fourteen days after delivery. From a case of metro-peritonitis.

Fig. 28. Inflammation-corpuscles as colostrum-corpuscles, mixed with milk-granules. Observed in the milk of a nurse, several months after delivery, which was given to me for investigation on account of remarkable symptoms of disease in the suckling. Magnified 255 times.

Fig. 29. Pus-corpuscles without distinct nucleolar structure, and a pigment-cell, *a.* *b.* The nucleoli remaining after treating the pus-corpuscles with acetic acid. Magnified 400 times.

Fig. 30. Pus-corpuscles of various sizes, and nucleoli, from a case of peritonitis puerperalis.

Fig. 31. Pus-corpuscles without distinct nucleoli; pyoid-corpuscles. These were found cohering together as a membrane, beneath the arachnoid upon the cerebrum and cerebellum of a man, aged 40 years.

Fig. 32. False membrane from the peritoneum. *a.* Consists of minute granules and inflammation-corpuscles. *b.* Nuclear fibres and pus-corpuscles.

Fig. 33. Spontaneously dividing fibres, *a*, from the membranous coagula of a true partial aneurism of the heart. *b.* Inflammation-corpuscles from the same. (See Obs. 51.)

Fig. 34. Exudation of the spleen after inflammation. Composed of nucleoli and irregular nuclei.

Fig. 35. An abrupt or bellied dilatation of a capillary vessel from the mesh-like softening of a corpus striatum.

Fig. 36. From the core of a boil, consisting of pus-corpuscles and fragments of dead areolar tissue.

Fig. 37. Development of blood-corpuscles. *a.* Thin lamina of an enchondromatous tumor, with red points consisting of blood-corpuscles. *b.* Some of the blood-corpuscles more highly magnified, which are larger than those of the healthy blood of the adult.

Figs. 38—42. Development of blood-corpuscles and blood-vessels from cells. All magnified 255 times. (See Obs. 52.)

Fig. 38. A thin section of the blood-mass with blood-corpuscles frequently with distinct colored nucleoli, within and exterior to cells. The blood-corpuscles are one-fourth larger than those normal in the adult, but are otherwise like them.[1]

Fig. 39. Isolated cells, with their blood-corpuscles.—*a.* Cells without prolongations. *b.* Cells which send out processes.

Fig. 40. Separated blood-corpuscles, sometimes irregular.

Fig. 41. Areolar tissue in the process of development. Nuclear fibres and cell-fibres from the tumor. Some fibres are formed by layers deposited around nuclei, others by the elongation of nuclei, and some proceed from nucleated cells. Sometimes several cell-fibres are united together. Similar fibres are found in new false membranes.

Fig. 42. Calcareous bodies, which appear to be calcified cell nuclei.

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[1] Probably, the simple or compound fat-like nucleoli preceded the formation of the originally colorless blood-vesicle. The whole relation of the blood-mass and of the tumor did not permit of a thought that secondary cell-formation occurred merely around coloring matter of the blood, for true blood-corpuscles existed.

HISTOLOGY.

Transformation of the Blood,
Exudation Corpuscles. Pus.

Fig. 1.

Fig. 2.

Fig. 3.

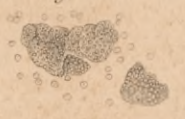


Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

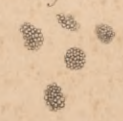


Fig. 8.

Fig. 9.

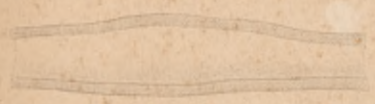


Fig. 10.

Fig. 11.

Fig. 12.

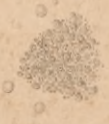


Fig. 13.

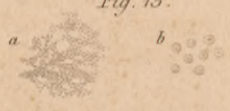


Fig. 14.

Fig. 15.

Fig. 16.

Fig. 17.

Fig. 18.

Fig. 21.

Fig. 22.

Fig. 23.

Fig. 24.

Fig. 25

Fig. 19.

Fig. 20.

Fig. 26.

Fig. 27.

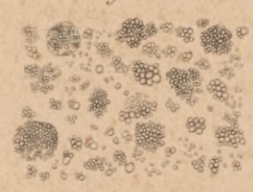


Fig. 28.

Fig. 29.

Fig. 47.

Fig. 32.

Fig. 33.

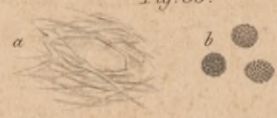


Fig. 37.

Fig. 30.

Fig. 31.

Fig. 34.

Fig. 35.

Fig. 36.

Fig. 38.

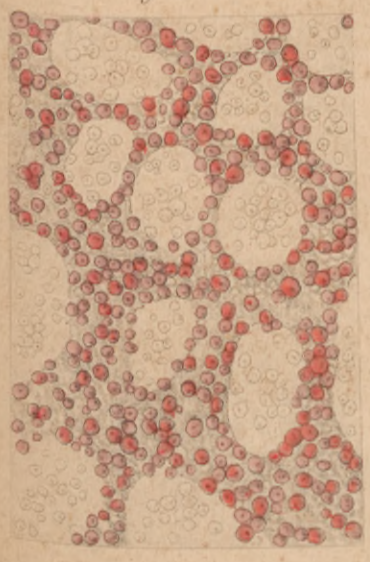


Fig. 39.

Fig. 42.

Fig. 43.

Fig. 41.

Fig. 44.

Fig. 46.

Fig. 40.

Fig. 45.

Vandendale ad nat. delt.

W. Müller sculp.

Fig. 43. Granulations from a healing wound of the knee. They consist of nuclei and vessels.

Fig. 44. Perfectly organized false membrane. It consists of cylindrical or fusiform fibres, which are nucleated, and which are parallel or reticulated. Among them is represented a bloodvessel.

Fig. 45. Development of epidermal cells, beautifully seen on the inner layer of the epidermis after the application of a blister. *a*. Nucleoli and nuclei. The latter already enveloped with a thin layer of the developing cell-wall. *b*. Perfectly developed cells.

Figs. 46, 47. Hematoidine. Crystals and granules formed from hematine. Observation kindly imparted by Dr. Lebert, of Paris. This gentleman observes: "The substance in which these crystals were contained was obtained from a liver in the vicinity of a hydatid tumor. I never before saw so great a quantity of crystals in any effusion. They were surrounded by a soft, elastic tissue, which was difficult to tear, but was readily extended upon a slip of glass, and was, in some places, orange yellow, in others ochre yellow. The portions of substance which contained the crystals were up to the size of an almond. I distinguished among the crystals two forms, of which one is described by Zwicky, but more particularly by Virchow. They are prismatic, with rhomboidal base, from the $\frac{1}{200}$ to the $\frac{1}{30}$ millimetre long, and $\frac{1}{2}$ to $\frac{2}{3}$ of the former dimensions broad. The second form of crystals, which, if I am not mistaken, have not yet been described, are acicular, the $\frac{1}{25}$ millimetre long, and the $\frac{1}{300}$ to the $\frac{1}{200}$ millimetre broad. Their color is orange yellow, but, while the former are often lively red, these are more brownish red. They were irregularly grouped, or arranged around an irregular spot, or a group of prismatic crystals formed beautiful rays in the form of a Maltese cross, consisting of from four to seven principal rays, each inclosing from seven to nine crystals.

"Concentrated mineral acids dissolve these only very slowly, and the bluish and other-mentioned phenomena of colors appear to take place more in the surrounding substance than in the crystals themselves. Only solution of potassa dissolves them quickly, and from this they do not crystallize again. The solution with potassa produces a peculiar green color, like the action of the latter upon the coloring matter of the bile. I have added, with the drawing of the above, some corpuscles which are nothing more than a retrogradation of coloring matter, and certainly not a mass of blood-corpuscles, as is believed by Kölliker; on the contrary, near these masses are observed blood-corpuscles deprived of their color."[1]

---

[1] At this moment, I have before me a case of apoplexy of the lungs, which is remarkable for the hundreds of hemorrhagic effusions which exist in the parenchyma and air-cells. The effusions form tumors from the size of a pea to that of a walnut, project beneath the pleura, but also exist in the centre of the lobes. In section they are homogeneous, red or pale red in the centre, or the reverse. In some of these tumors is found a soft yellow matter, which, besides yellowish hematoidine granules, contains also ruby red rhombic crystals, which undergo no change in concentrated sulphuric acid, except that the color changes to yellowish-red. The smallest measure $\frac{1}{300}$ millimetre long, the largest $\frac{1}{75}$ millimetre, and the half of these dimensions in breadth.

Very sparsely mixed with the others, are black rhombic crystals, the $\frac{1}{50}$ millimetre long and half as broad.

The large red crystals, in caustic potassa, broke up into several smaller ones, and there appeared upon them lines parallel to their breadth, before they were converted into an irregular yellowish-red matter. The black crystals, on the other hand, remained unchanged.

PLATE II.

GRANULATION. HYPERÆMIA. EXUDATION.

Fig. 1. (See Obs. 58.) Hyperæmia of the mucous membrane of the pelvis of the kidneys. The capillaries distended with blood-corpuscles. The space which, in a natural condition, is occupied by the liquor sanguinis to the exclusion of the blood-corpuscles has disappeared, and the hematine or coloring matter of the latter is partially dissolved out.

Fig. 2. Stasis of the blood, and metamorphosis of blood-corpuscles into inflammation-corpuscles. Some of the latter are represented still of a red color, and others colorless, intermingled with blood-corpuscles and fat-globules. From the mucous membrane of the uterus after delivery.

Fig. 3. (See Obs. 45.) Hyperæmia of the pia mater. *a.* Capillary presenting the normal relation of the blood-corpuscles to the inner parietes for comparison with *b*, representing a capillary, in the condition of hyperæmia, distended with blood-corpuscles, and part of the hematine of the latter dissolved in the liquor sanguinis.

Fig. 4. Cells taken from a chronic cancerous ulcer. *a.* Separated cells. *b.* The cells arranged in an imbricated manner, so as to form a membrane upon the surface of the ulcer. Some of the cells were endogenous. The nucleus is single or double. Breadth of the cells $\frac{1}{25}$ to $\frac{1}{33}$ millimetre.

Fig. 5. Large granular masses found with Fig. 4 in the same ulcer. They consisted of minute granules, from $\frac{1}{500}$ to $\frac{1}{400}$ millimetre in diameter, and were associated together in the form of inflammation-corpuscles.

Fig. 6. Pus-corpuscles from the same ulcer as 4 and 5. They belong rather to the category of pyoid-corpuscles, because they generally contained no nucleoli, but only some molecules of fat. The last three figures are magnified 550 times. (See Obs. 79.)

Figs. 7–13. Granulations from an ulcer. They consist of a blastema containing nuclei crowded together in streaks and nucleated cells, among which are bloodvessels and bundles of areolar tissue.

Fig. 7. The nuclei surrounded with blastema.

Fig. 8. A papilla tactus covered with nuclei.

Fig. 9. Some of the cells surrounded by concentric layers of fibrous tissue.

Fig. 10. First layer of epidermal cells. Where the cicatrization of the ulcer had commenced, nuclei could be seen in some places which had just formed a delicate wall around them.

Fig. 11. The epidermal cells fully formed and become polygonal.

Fig. 12. Pus-corpuscles.

Fig. 13. A portion of a granulation with bloodvessels and nuclei. The blood-corpuscles originate as circular, flattened nuclei, which are at first pale, but later become red. All the structures in Figs. 7–13 are from granulations, several inches high, from an ulcer of the foot, the result of caries of the bones, so that, in the same individual, the origin of the granulations in their progress to cicatrization could be studied.

Figs. 14, 15. Granulations from an ulcer. They consist of fibres of areolar tissue, in the meshes of which some amorphous substance and numerous pus-corpuscles with bloodvessels are contained.

Fig. 14. A granulation with its bloodvessels seen from above. Slightly magnified.

Fig. 15. Elements of the granulations. *a.* Cells. *b.* Fibres of areolar tissue and pus-corpuscles.

Fig. 16. Inflammation-corpuscles and fat from the lung of a dog nourished with oil.

Fig. 17. False membrane from the mucous membrane. From diphtheritis of the larynx. (Obs. 47.)

Fig. 18. Suppuration in the brain. Pus-corpuscles mixed up with the tubuli of the substance of the brain.

Fig. 19. Analogous structures to inflammation-corpuscles found in the ovary of the hen. From these, as is represented in the largest figure, the egg is developed, in the primitive granular layer of which the Purkinjean or germinal vesicle arises. Magnified 255 times.

Fig. 20. First form of nuclear fibres. Lamellar structures around nuclei found in exudations.

Fig. 21. Inflammation of the muscular fibres of the heart. Carditis. The primitive muscular fasciculi covered with exudation-granules, upon the removal of which the transverse striæ again become visible.

Figs. 22–24. Carditis. (See Obs. 50.)

Fig. 22. *a.* The muscular fasciculi covered with exudation-granules. The primitive fasciculi, granular and opaque, appearing black by transmitted light, and mixed with some inflammation-corpuscles. Only here and there fibres with the longitudinal striæ still visible, *b.*

Fig. 23. Inflammation-corpuscles from $\frac{1}{100}$ to $\frac{1}{75}$ millimetre diameter, which appeared immediately to be spontaneously

HISTOLOGY.

Granulation, Hyperæmia, Exudation.

Plate II.

Fig. 1.

Fig. 2.

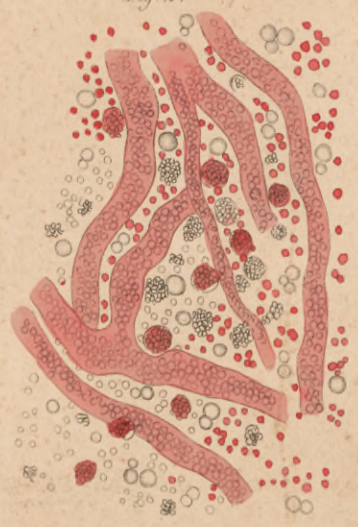


Fig. 3.

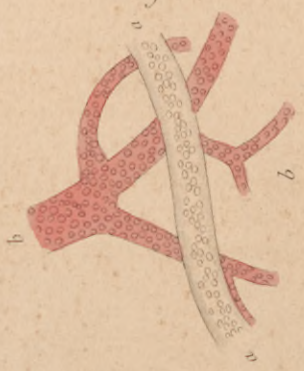


Fig. 4.

Fig. 5.

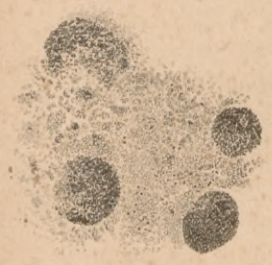
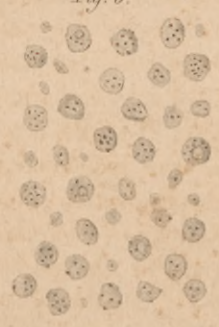


Fig. 6.



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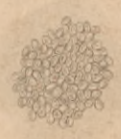

Fig. 8.

Fig. 9.

Fig. 4.

Fig. 14.

Fig. 15.

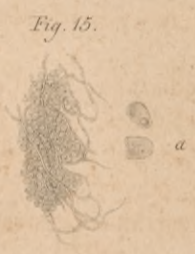

Fig. 10.

Fig. 11.

Fig. 12.

Fig. 13.

Fig. 16.

Fig. 17.

Fig. 18.

Fig. 19.

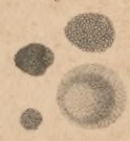

Fig. 20.

Fig. 21.

Fig. 22.

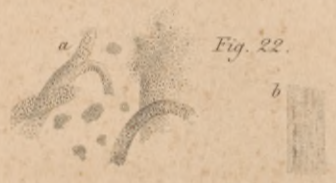

Fig. 23.

Fig. 24.

Fig. 25.

Fig. 26.

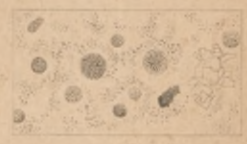

Fig. 27.

Fig. 28.

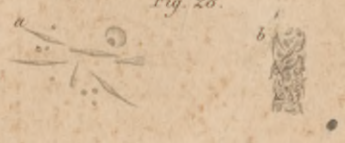

Fig. 29.

Fig. 30.

Fig. 31.

Fig. 32.

Fig. 33.

Fig. 34.

Fig. 35.

Fig. 36.

Fig. 37.

Fig. 38.

Vandendale ad nat. delt.

converted into pus-corpuscles of the same size. From abscesses of the kidneys of the same individual.

Fig. 24. An inflammation-corpuscle surrounded by blood-corpuscles, from ecchymoses of the kidney of the same individual.

Fig. 25. Origin of epithelial cells in catarrh, by the formation of a layer around nuclei. The latter and the cells were mixed with pigment-cells.

Fig. 26. Inflammatory exudation from the gall-bladder, with crystals of cholesterine. The inflammation-corpuscles here represented will certainly not be considered as epithelial cells infiltrated with fat. Besides these may be noticed inflammation-corpuscles still ununited. (Obs. 48.)

Fig. 27. Inflammatory softening of the brain. Numerous inflammation-corpuscles among the fragments of nerve tubuli of the white substance. In some of the corpuscles a nucleus was already formed.

Fig. 28. Granulations of the testicle simulating cancer. *a.* Fusiform fibres and cells. *b.* The same in groups with nuclei, which, with bloodvessels, constituted the granulations.[1]

Figs. 29–34. (Obs. 6.) Interlobular inflammation of the kidneys.

Fig. 29. A granulation from the cortical substance of the kidney, of the natural size.

Fig. 30. *a.* Epithelial cells; and *b*, nuclei of the liquid scraped from the granulations. Magnified 400 times.

Fig. 31. A uriniferous tubulus from the cortical substance, filled with nuclei only.

Fig. 32. Nuclei among the granulations.

Fig. 33. Section of the medullary substance. Tubuli uriniferi filled with nuclei.

Fig. 34. Elongated nuclei among the granulations, the result of exudation, between the lobules of the kidney.

Figs. 35, 36. Inflammation of the kidneys. Among the tubuli uriniferi *c*, still invested by their epithelium, were inflammation-corpuscles *a*, and pus-corpuscles *b*. Only rarely the tubuli contained minute fat-granules.

Fig. 37, *a*. Cylindrical epithelial cells and nuclei from fluor albus of the uterus.

Fig. 37, *b*. Epithelial cells, in some instances filled with fat-granules, from fluor albus of the vagina.

Fig. 38. Pus from an inflamed gall-bladder.

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[1] A man, 65 years old, after a cold, for nearly three weeks felt a painful swelling in the left testicle. After leeching, the pain ceased, but the feebly-fluctuating swelling remained about the size of a fist. It was formed by the epididymis, which, at one place, was grown fast to the scrotum. Upon puncturing it, a quantity of normal pus exuded. After about eight days, there arose from the wound a cauliflower-like tumor, whitish-yellow, easily bleeding, moderately hard, and not painful on being cut. Under proper treatment, the patient left the hospital cured. That such a case might be confounded with cancer of the testicle, A. Cooper has already remarked. Whether the granulations in this case grew from the tunica vaginalis, or the interior of the testicle proper, is uncertain; but the former is the more probable, if we may judge from the rapid healing, and the return of the testicle to its normal bulk.

PLATE III.

STEAROSIS.

[The most frequent pathological occurrence of adipose tissue is in the case of fatty hypertrophy, in fatty degeneration of certain organs, as of the heart and muscles, and in the formation of fatty tumors, as lipoma consisting wholly of fat, and steatoma partially composed of areolar tissue. All these fatty productions consist of adipose cells, resembling, for the most part, those of normal adipose tissue.

In other cases, fat is morbidly developed in the form of free granules or globules of variable size in or among the normal structures of the organs. In this manner it is deposited within or between the hepatic cells in fatty liver, within and around the tubuli uriniferi in fatty degeneration of the kidney, etc. It is also frequently found deposited in the same form in other morbid structures, as in encephaloid, tubercle, atheroma, pus, etc.—TRANS.]

Figs. 1–5. Stearosis of the liver and kidney. (Obs. 37.)

Fig. 1. A fragment of the granular liver injected, seen from the surface. The hepatic artery is injected yellow, the branches of the vena portæ green. The capsule of Glisson has been removed.

Fig. 2. Granulations of various sizes, from the under surface of the liver.

Fig. 3. Section of the granulations, of the natural size.

Fig. 4. Portion of a granulation magnified 255 times. *a*. Hepatic cells partially filled with fat. *b*. Isolated fat-globules which escaped from the cells in the violence used in making the observation.

Fig. 5. Tubuli uriniferi filled with fat-granules, the epithelium having disappeared.

Figs. 6–8. Stearosis of the liver and kidney.

Fig. 6. Hepatic cells filled with fat-granules.

Fig. 7. Tubuli uriniferi deprived of epithelium and filled with fat. From the kidney of a dog nourished with oil.

Fig. 8. Hepatic cells filled with fat, and which, for the most part, have lost their polygonal form.

Fig. 9. Stearosis of the kidney.[1] Epithelial cells of the tubuli uriniferi filled with fat. Magnified 550 times.

Fig. 10. A Malpighian corpuscle, the epithelial cells of which are infiltrated with fat.

Fig. 11. Stearosis of the testicle. *a*. Fat-granules and inflammation-corpuscles. *b*, *c*. Fragments of tubuli seminiferi, of which one is filled with fat-granules. (Obs. 67.)

Fig. 12. Fatty liver, from a dog fed upon oil. Granulations at the surface, of the natural size.

Figs. 13, 14. Stearosis of the pancreas. (Obs. 25.)

Fig. 13. A single glandular follicle of the pancreas, invested with its epithelial cells containing fat-granules. Magnified 255 times.

Fig. 14. A single glandular lobule slightly magnified. The follicles are observed to have become opaque, from their being infiltrated with fat.

Fig. 15. Stearosis of the heart. From a woman, 67 years of age, who died of a double pleuritis with fibrinous exudation, and pneumonia. Fatty liver. A cyst the size of a walnut, in the left ovary. Three small fibrous tumors in the substance of the fundus of the uterus, of which one was calcified. The right ventricle straw-colored, and among its muscular fasciculi, as represented in the figure, were layers of fat-cells and fat-globules. The transverse striæ of the muscular fibres had disappeared, and were replaced by granules.

Fig. 16. Stearosis (atheroma of the arteries).[2] Liquid atheromatous matter from beneath the lining membrane of the

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[1] Compare the very excellent observations of Gairdner, in whose views, however, I do not entirely participate. I find the fat-granules seldom in the cells of the tubuli uriniferi, which are commonly cast off. (See the *Edinburgh Monthly Journal*, 1848.)

[2] The question, whether atheroma has its seat between the middle and inner tunics of arteries, appears to me to be easily decided, when we previously understand that the term means only a substance resembling that of atheromatous tumors (meliceris), and consisting, for the most part, of fat. That it does not originate from the well-known yellowish spots found beneath the lining membrane of arteries, can be the opinion only of those who assert such spots remain for years without change, as if this could be the subject of direct observation. But, besides atheroma, there occur the familiar cartilage-like, pearly deposits, sometimes arranged in concentric layers, upon the lining membrane of the arteries, which may be viewed as immediately derived from the blood. These exhibit the structure of coagulated fibrine; are striated or granular, at most have only a few nuclei, and have no analogy to the vascular tunic. They are often extensively distributed, and occur in combination with atheroma, a half or one line thick, upon atheromatous deposits; but, nevertheless, I have not been able to convince myself that the fibrinous matter undergoes conversion into atheroma, that is, into fat. The atheroma appears to me always to be deposited beneath the vascular lining, even when this is covered with the cartilage-like plates mentioned, and these then appear to become infiltrated by the former. The conversion of fibrine into fat is an hypothesis, and, above all, wants proof.

HISTOLOGY.

Stearosis.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

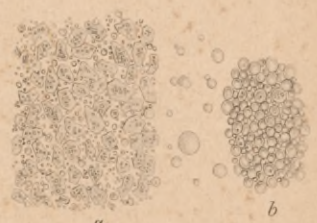

Fig. 5.

Fig. 6.

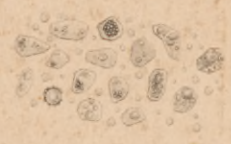

Fig. 7.

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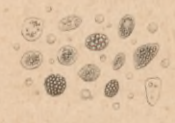


Fig. 9.

Fig. 10.

Fig. 11.

Fig. 12.

Fig. 13.

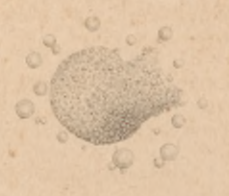


Fig. 14.

Fig. 15.

Fig. 16.

Fig. 17.

Fig. 18.

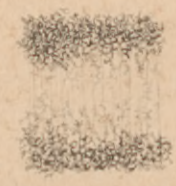


Fig. 19.

Fig. 20.

Vandendale ad nat. delt.

W. Müller sculp.

aorta, consisting of isolated fat-globules, inflammation-corpuscles, and cholesterine in crystals.

Fig. 17. Fibres of the middle coat of the aorta infiltrated with fat-granules.

Fig. 18. A thin section, polished, of a calcified spot from the middle coat of the aorta. The three last figures magnified 255 times.

Figs. 19, 20. Stearosis, and formation of cysts in the kidney.

Fig. 19. Fat-cysts between two uriniferous tubules. Magnified 255 times.

Fig. 20. Represents some of the numerous small cysts of the same kidney, viewed by a simple pocket-lens.

PLATE IV.

CARTILAGE AND OSSEOUS TISSUE.

(OSSIFICATION.)

[ENCHONDROMA, in structure, resembles very much a true fibro-cartilage, consisting of a fibrous stroma, with the loculi filled by an amorphous translucent substance containing imbedded cells, like those of normal cartilage.

Besides hypertrophy and exostoses of the bones, osseous tissue may occur morbidly in certain of the softer tissues. Its production, however, in ossification of the laryngeal cartilages, or those of the ribs, can hardly be considered of this character. It may occur in the tendons, ligaments, aponeuroses, submucous tissue, subserous tissue, in the retina, crystalline lens, muscles, and I possess a discoidal specimen, about a half an inch in diameter, which I took from the interior of the kidney of a mink.—TRANS.]

Fig. 1. Cartilage nuclei and cells, the walls of which begin to become condensed, whilst the nuclei, which probably are hollow, have their wall infiltrated with calcareous matter. The intercellular substance is small in quantity. From a portion of callus still in a cartilaginous condition, from a fracture of three weeks existence, in a dog.

Fig. 2. Section of the reticular osseous substance, with the hollow processes of the osseous corpuscles faintly visible. From the same case as the preceding.

Figs. 3, 4. Enchondroma of the testicle, from a youth of 18 to 19 years. There has been no return of the disease, the tumor having been extirpated two years since. The cartilaginous substance, in the form of plates about the size of peas, was insinuated through the enlarged testicle.

Fig. 3. Representation of the early development of cartilage-cells. The nuclei are formed, but, for the most part, the cell-wall appears only as a clear band-like ring, *a*, around the nuclei. At *b*, a distinct cell-wall has appeared.

Fig. 4. The same cells perfectly developed. They are simple, or are of the character of mother-cells.

Figs. 5, 6. Ossified cartilage from the cartilago thyroidea of the larynx.

Fig. 5. Cartilage-cells, in which ossific matter has commenced to be deposited.

Fig. 6. Fully-formed bone with bone-corpuscles (corpuscles of Purkinje) and vascular canals (Haversian canals).

Figs. 7, 8. Softening of the bones. (See Obs. 58.)

Fig. 7. Softened compact substance of the tibia, in which the bone-corpuscles were still visible, but indistinct.

Fig. 8. The bone-corpuscles without branches, and only recognizable in their outline.

Fig. 9. Spongy condition of the bone in caries; and disappearance of the calcareous matter from the bone-corpuscles.

Fig. 10. Section from a cartilaginous callus of a clavicle from an old woman of 80 years. The bone-corpuscles are clear, and almost entirely devoid of calcareous matter.

Fig. 11. Section of a lamella of bone from an osteoid tumor or osteophyte filled with jelly-like matter. It contains bone-corpuscles and Haversian canals. The branches of the former frequently anastomose, as represented also in Figs. 6 and 7. These branches form a system of canals by which the bone-corpuscles communicate with one another.

Figs. 12–15. Calcification of tubuli uriniferi. (Obs. 58.)

Fig. 12. Section of a pyramid of the renal medullary substance, of the natural size. Clear spots are represented upon the striated substance, which are calcifications visible to the naked eye.

Fig. 13. Two tubuli uriniferi calcified. Sometimes the calcareous matter forms scale-like plates, as represented in Fig. 14, which are readily separated, and have indistinct limits, as seen in Fig. 15.

Fig. 16, *a*, *b*. Concretions, which existed in great number, deposited in a placenta. They consist of the villi covered with calcareous matter, as exhibited by *a*. *b*. One of the concretions separated.

Fig. 17. Calcareous concrement from the aorta, separated from the middle coat, which is often covered with such regular plate-like masses.

Fig. 18. Calcification of capillary vessels. These appear dark by transmitted light *a*, but by treatment with acids they become more translucent, and nuclei are brought to view, covering the walls which were the seat of the deposit *b*.

Fig. 19. Reproduction of a tibia from the external periosteum after the destruction of the internal periosteum. *a*. Old necrosed bone. *b*. New bone.

Figs. 20–23. Reproduction of a bone after necrosis.

HISTOLOGY.

Plate IV.

Cartilage and Osseous Tissue.

Ossification.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

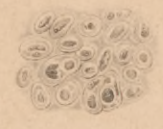
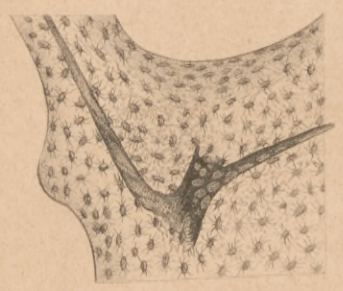


Fig. 5.

Fig. 6.



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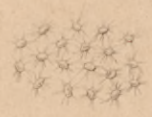

Fig. 8.

Fig. 9.

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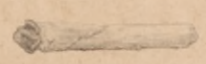

Fig. 22.

Fig. 23.

Fig. 24.

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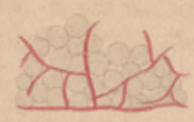
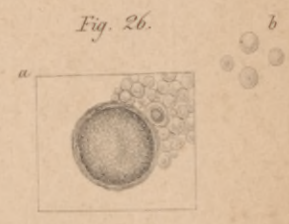


Fig. 26.



Vindendale ad. nat. delt.

W. Müller sculp.

Fig. 20, *a*, *b*. Represent the two halves of the bone sawed open.

Fig. 21. The old bone, which was taken from within that of Fig. 20.

Fig. 22. The new internal periosteum consisted of nuclei, *a*, and single cells containing numerous nuclei, *b*.

Fig. 23. Longitudinal section of the newly-formed bone. The bone-corpuscles were yet clear, without radiating branches. The section surrounds a Haversian canal.[1]

Fig. 24. Concretions from the spleen. *a*. Natural size. *b*. Lamellæ of which they consist, magnified 255 times. From an individual who died with vomiting of blood, and had a fungus medullaris of the liver.

Figs. 25, 26. Calcified cells from the plexus choroides of an old man of 60, who died from an apoplexia meningea. It was, in this case, very evident how the calcareous bodies of the folds of the plexus choroides originated by a concentric deposit of calcareous matter within the newly-formed cells of the plexus.

Fig. 25. The calcareous bodies, or calcified enlarged cells between the bloodvessels of the plexus. Magnified 55 times.

Fig. 26, *a*. Numerous newly-formed cells, among which a small and large one contain a calcareous concretion. The concentric lamellar disposition of the body is particularly quite visible in the smaller. *b*. Young cells of the same plexus, some of which have no nuclei. None of the cells have processes; the deposit of calcareous matter begins in the nucleus, and advances upon the growing cell. Magnified 255 times.

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[1] Figs. 19–23 represent preparations obtained from a pigeon in which I had destroyed the marrow of the tibia. The experiment was made on the 1st of February, and the animal killed on the 16th of March. The diaphysis was dead and was easily removed from within the new one. The former was necrosed, covered with pus, and separated from the latter by a new internal periosteum. This measured $\frac{1}{4}$ mil. thick, was velvety and easily removed, and consisted of an amorphous blastema in which were numerous nuclei from the $\frac{1}{200}$ to the $\frac{1}{150}$ mil. in alternating layers with fat-granules and large cells (Fig. 22, *b*), containing many nuclei. The latter appeared to be the forming fat-vesicles of the marrow. The new internal periosteum is non-vascular, whilst the marrow found upon the sequester was strongly injected. Muscles and tendons had already become attached to the external periosteum of the new bone.

PLATE V.

CELLS, FIBRES, AND CELL-FIBRES, IN TUMORS.

Figs. 1–7. Albuminous sarcoma. (See Obs. 69.)

Fig. 1. Inflammation-corpuscles from a softened spot of the sarcoma.

Figs. 2, 3. Nuclei which formed the principal mass of the sarcoma. Fig. 2, magnified 550 times; Fig. 3, 255 times.

Fig. 4. Fibrous stroma.

Fig. 5. Smooth fibres with inflammation-corpuscles, which were sometimes colored reddish.

Fig. 6. Mother-cells, which were rare in the tumor.

Fig. 7. Fusiform bodies, also rare.

Figs. 8–11. Albuminous sarcoma. (Obs. 72.) In a formless blastema, filling the meshes of a tissue composed of thin fasciculi of soft, smooth fibres, with irregular outline, lie thickly crowded roundish nuclei with nucleoli, roundish cells, and inflammation-corpuscles.

Fig. 8. The elements just mentioned united. The greater proportion of the mass is composed of the nuclei.

Fig. 9. Nuclei, $\frac{1}{100}$ mil. in diameter.

Fig. 10. Cells and inflammation-corpuscles.

Fig. 11. Fibres.

Figs. 12–14. Albuminous sarcoma, probably developed from a lipoma. (Obs. 68.)

Fig. 12. Fat-vesicles, which still existed in a lobule of the tumor.

Fig. 13. A network of flat fibres with nuclei, which formed the principal mass of the tumor, and a few cells.

Fig. 14. A tendinous spot in the tumor, the fibres of which appeared to consist of single nuclei.

Figs. 15, 16. Albuminous sarcoma. (Obs. 70.)

Fig. 15. Fibrous net with cells and nuclei.

Fig. 16. Simple cells *a*, and others with several nuclei *b*. *c*. Fusiform fibres. One of the last is formed by the elongation of a nucleus; the other, by the deposit of blastema around a nucleus.

Figs. 17, 18. Jelly-like sarcoma from the brain.

Fig. 17. Simple cells, mother-cells with nuclei, nuclei, and amorphous matter, which were deposited in a net composed of fasciculi of fibres.

Fig. 18. Inflammation-corpuscles.

Figs. 19–21. Sarcoma, composed of nuclear fibres, passing into medullary cancer. (Obs. 71.) Erroneously considered as albuminous sarcoma.

Fig. 19. Fusiform nuclear fibres, and nuclei; obtained by scraping. The nuclei are not dissolved by acetic acid.

Fig. 20. A section of the tumor. The fibres originate in this case by the elongation of the nuclei.

Fig. 21. Elliptical and round granules, of which the principal mass of the medullary cancer consisted, which was developed after the extirpation of the sarcoma.

Fig. 22. Nuclear fibres from a fibrous tumor of the uterus.

Fig. 23. Epithelial cells which formed the investing membrane of a polypus of the ear. From a woman 30 years of age. The polypus was pedunculated, and was situated in the external auditory meatus. Its internal structure consisted of a soft, gray-yellowish mass, composed of fibres of areolar tissue, epithelial cells, and nuclei.

Fig. 24. Fibrous structure of an encysted tumor. Cysto-sarcoma. Fusiform fibres and nuclei. (Obs. 59.)

Fig. 25. Lipoma. Fat-vesicles and fibres. From a lipoma beneath the peritoneum.

Fig. 26. Polypus of the nose, consisting of fusiform fibres and nuclei. Only one cell was observable. The fibres in this case originated in elongation of nuclei.

Figs. 27, 28. Meliceris.

Fig. 27. Cells which formed the gray membranous mass.

Fig. 28. Nuclei of the yellow principal mass. The tumor was situated in the face, and the contents of the cyst consisted of a soft, gray, but especially of a yellow mass, arranged in concentric lamellæ. The cells were $\frac{1}{33}$ mil. in diameter, and were not soluble in acetic acid. The nuclei were of the size of blood-corpuscles.

Fig. 29. Cells which constituted the contents of a so-called congenital ranula.[1] It consisted of several parts the size of a walnut, which emptied separately.

Figs. 30–33. Goitre in the form of cysts, from a woman. The thyroid gland partly consisted of a quantity of large and small cysts, of which some had strong walls, partly cartilaginous, and partly calcified, and containing within them a chocolate-like liquid. The latter contained round nucleated cells (Fig. 31), averaging the $\frac{1}{50}$ mil. in diameter. Other cells were

[1] According to Fleischmann (*De novis sub lingua bursis*, Norimbergi, 1841), ranula consists in a swelling of a mucous follicle beneath the tongue. The form of the ranula in this case confirms this view.

HISTOLOGY.

Cells, Fibres, and Cell Fibres. in Tumours.

Plate V.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

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Fig. 18.

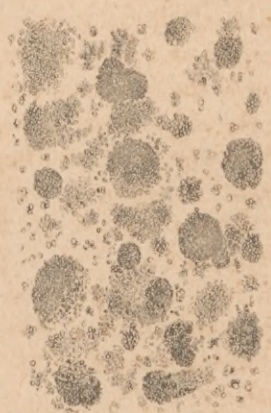

Fig. 19.

Fig. 20.

Fig. 21.

Fig. 22.

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Fig. 26.

Fig. 27.

Fig. 28.

Fig. 29.

Fig. 30.

Fig. 31.

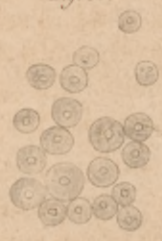

Fig. 32.

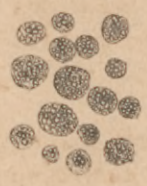

Fig. 33.

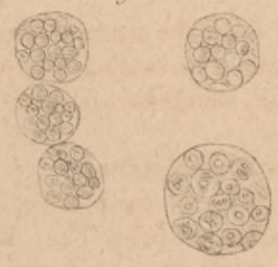

Fig. 34.

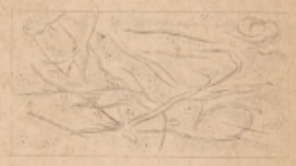

Fig. 35.

Fig. 36.

Fig. 37.

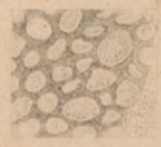

Fig. 38.

Fig. 39.

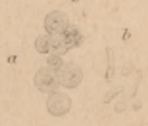

Fig. 40.

Fig. 41.

Fig. 42.

Vandendale ad nat. delt.

infiltrated with fat, as represented in Fig. 32. Another portion of the gland in section consisted of follicular spaces, filled with jelly-like matter (the normal glandular follicles enlarged), deposited in a network of fasciculi of fibrous tissue.

Fig. 30, represents some of these follicles of the natural size. The jelly-like mass was translucent, reddish, and consisted of an amorphous blastema, with round cells like those of Fig. 31, some nuclei, mother-cells with many nuclei, and other mother-cells with secondary cells, as represented in Fig. 33.[1] The jelly-like mass contained also numerous capillary vessels. In this case, with the enlargement of the normal gland-vesicles, they became filled with a new jelly-like blastema, in which originated new cells, while the wall of the original vesicles was dissolved, and calcification finally associated together the walls of the cavities formed of the intervesicular areolar tissue.[2]

Figs. 31–33 are magnified 255 times.

Figs. 34–41. Secondary colloid cysts developed from mother-cells. Taken from an ovary. (Obs. 66.) Also, colloid of the liver in the same case.

Fig. 34. Apparent formation of fibres, in the jelly-like contents of the cysts, whilst the observation was being made.

Fig. 35. Membrane of the mother-cysts slightly magnified. Inflammation-corpuscles between the capillary vessels.

Fig. 36. Inner surface of a mother-cyst, natural size, to exhibit the origin of new cysts upon it.

Fig. 37. The same magnified 25 times.

Fig. 38. The fibrous structure of the membrane of the mother-cyst, which forms the areolæ in which the young cysts are developed. The bloodvessels are not represented. Magnified 255 times.

Fig. 39. Roundish (*a*) or cylindroid epithelia (*b*), which in some places covered the inner surface of the mother-cyst.

Fig. 40. Contents of the cyst, consisting of nuclei, roundish cells, fat-molecules, and inflammation-corpuscles.

Fig. 41. Colloid of the liver mixed with cancer-cells.

Fig. 42. Crystals of cholesterine from a cholesteatoma of the testicle. The mass was semiliquid, of the size of a walnut, of a pearly lustre, and was found in the testicle with its surface covered by the tunica albuginea.

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[1] Their existence in goitre, as stated by Rokitansky, is unjustly doubted by Ecker. See the excellent treatise upon goitre of Ecker in Henle and Pfeuffer's *Zeitschrift*, vol. vi. 1847.

[2] The formation of endogenous cells in goitre, is confirmed in this case. See also Plate XII. Figs. 27 and 28.

PLATE VI.

FORMATION OF FIBRES AND CELLS IN CANCER.

I MUST here mention that in cancer, more frequently than in other pathological products, the cells present peculiarities, examples of which are given in this and the succeeding plate. 1. There occur cells without nuclei inclosed within other cells, as represented in Plate VI., Fig. 11, *a*. 2. Triple cells, the innermost of which also incloses a nucleus with its nucleolus. Two explanations might be presented for these phenomena: either that pre-existing nuclei within cells are converted into cells, or that portions of cell-contents form cells; both of which modes of development, according to Nägeli, occur in plants.[1] Although cells constructed like *a* may be formed according to the first-mentioned method, and such as *c* by the second method, yet neither will do to explain the origin of a case like *f*, and this would be better understood by supposing the incasing of cells arises from the successive development of one cell upon the other, with or without the previous formation of a nucleus.

Probably these forms of cells originate according to three types: 1, by the construction of cells from nuclei; 2, by the deposit of a new cell-wall around portions of the contents of a cell; and, 3, by the deposit of one cell-wall upon another cell.

The cancer-cell is peculiarly adapted to the study of the alterations which the contents constantly undergo in form and composition by reciprocal interchange with the surrounding material through endosmosis and exosmosis. In it, for example, may be traced the conversion of clear water-like contents into granules and nuclei, as represented in Fig. 15, Plate VII. and Figs. 8 and 11, Plate VI.

Moreover, if, as has been asserted by Nägeli, animal cells in general are endowed with a contractile power, nowhere could the phenomena of contraction be so easily observed as in the cancer-cells, because they may always be examined in a perfectly fresh condition. But I have never seen such contractions in the organic cells of man and other mammalia, whether in a physiological or pathological state, and, although contractile cells are indisputably found in lower animals, muscular fibres cannot be considered as belonging to the same category, because they have changed their form from the cell to an especial one.

Fig. 1. Cancerous ulcer of the uterus. The stinking greenish mass into which the neck of the uterus liquefied, consisted of simple, roundish cells, with a simple nucleus from the $\frac{1}{100}$ to the $\frac{1}{75}$ mil. in diameter, some fusiform cells, and some inflammation-corpuscles, as represented by *a*, also a few mother-cells, as in *b*, averaging the $\frac{1}{50}$ mil. in diameter. The secondary cells within the latter were with and without nuclei.

Figs. 2–3. Cancer in the face. (Obs. 77.) The cancerous tumor of the skin consisted of small granular groups deposited in an amorphous blastema, as represented by *a*, moderately magnified. The groups were composed of simple cells elongated, clavate in form, Fig. 3, *a*, *d*; of others with one or several nuclei, *b*, *c*, frequently replaced by a globular agglomeration of fat-granules; and of mother-cells, like in Fig. 2, *b*, in which the early formation of the nucleus, and the foundation of new cells (formation around portions of the contents of a primary cell), were distinctly visible.

Figs. 4–8. Cancer of the eye. (Obs. 77.)

Fig. 4. The cerebriform mass which replaced the retina. In an amorphous stroma, pervaded with capillary vessels, are deposited nuclei, which have a depression, and sometimes have a nucleus. One cell only is visible.

Fig. 5. Fibres, from the crystalline lens, which distinctly branch. Among them are several nuclei, and a black pigment-cell.

Fig. 6. Neurilemma of the optic nerve, with intercalated nuclei.

Fig. 7. Nuclei mixed with black pigment-cells, from the vitreous humor.

Fig. 8. Large single nucleated cells, with colorless amorphous contents, $\frac{1}{50}$ mil. in diameter. From the cancerous mass of the orbit.

Fig. 9. Normal cells from a healthy thymus gland of a child at birth. Nuclei, which appear to be hollow, and contain one or more nucleoli, and to the right, a mother-cell similar to those found in cancer.

Fig. 10. Scirrhus of the female mamma, in an ulcerated condition. The figure represents a thin slice of the tissue of the gland, which was very hard to cut. It exhibits a granular amorphous mass, with indistinct fibres, and no trace of cells. The granules sometimes were disposed more densely in groups. After extirpation it returned, and death occurred in half a year subsequently.

Fig. 11. (Obs. 74.) Cancer of the tongue. The cream-

[1] Zeitschrift für wissenschaftliche Botanik.

HISTOLOGY.

Formation of Cells in Cancer

Fig. 1.

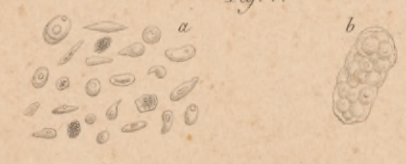

Fig. 2.

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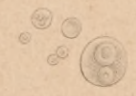

Fig. 10.

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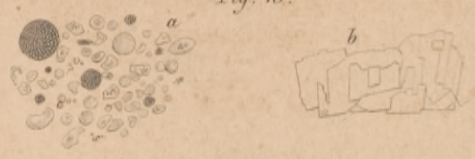

Fig. 16.

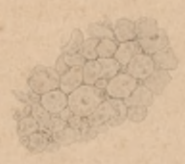

Fig. 17.

Fig. 18.

Fig. 19.

like cancerous mass consisted of roundish cells, with clear, and sometimes granular contents, the $\frac{1}{3}\frac{1}{7}$ mil. in diameter. The figures mostly represent mother-cells in various stages of development.

Figs. 12–13. (Obs. 73.) Cancer of the parotid gland. Catarrh of the kidneys and bladder. The cancerous mass consisted of cells with a simple nucleus, sometimes with the contents composed of calcareous granules or nuclei, *a*. The urine, in the bladder affected with catarrh, was cloudy and purulent, and contained simple cells, nuclei, mother-cells, and fusiform fibres, *b*. The cells measure from $\frac{1}{1}\frac{1}{0}\frac{1}{0}$ to $\frac{1}{3}\frac{1}{3}$ mil. The nuclei $\frac{1}{1}\frac{1}{3}\frac{1}{3}$ mil. These cell-forms originating in catarrhal inflammation of the bladder are not distinguishable from those of cancer.

Fig. 13. The tubuli uriniferi of the papillæ renales were distended with young epithelial cells *a*, and when the papillæ were pressed a cloudy liquid exuded, which contained a great many of the same kind of cells, *b*.

Figs. 14–16. Cancer proceeding from the submaxillary gland. (Obs. 81.) *a*. Cells, nuclei, and nucleoli from the cancer; *b*, the same mixed with inflammation-corpuscles; *c*, do. among muscular and tendinous fibres; *d*, cells without nuclei, sometimes irregular or polygonal; *e*, fusiform fibres. The contents of the ducts of the gland consisted of fat-granules, cells filled with fat, and young epithelial-cells, as represented in Fig. 15, *a*, and cholesterine crystals, *b*.

Fig. 16. Represents the cells, measuring $\frac{1}{5}\frac{1}{0}$ mil., which replaced the terminal vesicles of the healthy gland. These vesicles ordinarily average the $\frac{1}{1}\frac{1}{6}$ mil. and are invested upon their inner surface with longish nuclei. In the figure may be observed the early foundation of cells advancing to a structure approximating the normal one. The preparation was taken from a part of the gland in which the acinose structure was still distinguishable.

Figs. 17, 18. Scirrhus of the mamma. (Obs. 82.) Section of a granulation consisting of areolar fibres covered with inflammation-corpuscles and having intermingled young cells, Fig. 18.

Fig. 19. Cancer of the œsophagus. Formation of concentric fibrous layers around cancerous cells.

PLATE VII.

FORMATION OF FIBRES AND CELLS IN CANCER. PIGMENT.

Figs. 1–3. Cancer of the œsophagus. Cell and fibre formation. Calcification of cancer-cells. (Obs. 84.)

Fig. 1, *a*. Cells prolonged into fibres. *b*. Two of the latter associated into one. *c*. Cell with three nuclei. *d*. Group of cells with compound nuclei. *e*. Fasciculus of fibres, which have proceeded from fusiform cells, still retaining their nuclei. *f*. Calcified medullary cancer-cells. *g*. A mother-cell in which endogenous cell-formation around portions of the contents may be traced. All these figures are from the structure of the cancerous mass of the œsophagus. The cell-wall was not soluble in acetic acid. (So called epithelial cancer.)

Fig. 2, *a*, *b*. Cancer-cells from a calcified lymphatic gland. Several are transparent, and others are filled with calcareous granules, which dissolve with effervescence in mineral acids and render the cells transparent. The calcareous deposit appears to commence in the nucleus.

Fig. 3. Fibres from the same.

Fig. 4. *a–d*. Cancer of the œsophagus. (Obs. 85.) Nucleated cells and fusiform fibres. *c*. A mother-cell with many nuclei.

Figs. 5–9. Medullary cancer and pigment. (Obs. 86.)

Fig. 5. Black pigment in granules, and a cell filled with the same; from the lungs.

Fig. 6. Medullary cancer-cell nuclei mixed with inflammation-corpuscles from the mesenteric glands. The former measured from $\frac{1}{133}$ to $\frac{1}{100}$ mil.

Fig. 7. Group of the same kind of nuclei.

Fig. 9. Cells of $\frac{1}{50}$ mil. in diameter, sparingly mixed with the latter.

Fig. 8, *a*, *b*. Represent fibrinous laminæ and fibres with inflammation-granules, from a false membrane of the peritoneum.[1]

Figs. 10–14. Medullary cancer, contemporaneous with melanosis and red pigment in the liver. (Obs. 88.)

Fig. 10, *a*. Fat-granules and inflammation-corpuscles, which, with a fibro-striated exudation, made up the large yellow mass in the liver. Where the yellow masses formed granulations, these consisted of round nucleated cells mingled with others which were polygonal, or a little elongated, measuring the $\frac{1}{100}$ mil. by the $\frac{1}{200}$ mil., as seen in *b*. These cells in their form approach so nearly those normal of the liver, that the medullary cancer may be said to have imitated the structure of the liver-cells. *c*. Fusiform fibres which were sometimes mixed with the cells. *d*. A single granulation, consisting of normal hepatic cells and cancer-cells filled with fat.

Fig. 11. Melanosis. *a*. Nucleated cells filled with black pigment, and granules of the latter, which have escaped from the former by pressure. *b*. Groups of pigment-granules escaped from cells.

Fig. 12. A fine section of a medullary cancer, consisting of hepatic cells, mixed with the medullary cancer-cells.

Figs. 13, 14. Conversion of blood into pigment. Black granules with hematoidine granules in medullary form, mixed together, from the firm coagulum of blood taken from the vena portæ of the same liver.[2]

Figs. 15–23. Medullary cancer of the skin, mammary gland, muscles, pleura, lungs, pericardium, lymphatic glands, and peritoneum. (Obs. 75.)

Fig. 15. Structure of the medullary cancer, first removed from the skin of the back some days after its appearance. It consists of roundish or nearly polygonal cells, generally with one, rarely with two nuclei, sometimes filled with fat, and sometimes mixed with inflammation-corpuscles. The cells measured about the $\frac{}{50}$ millimetre, and were inclosed in a fibrous stroma.

Fig. 16. Cells, from the medullary cancer of the cervical lymphatic glands, in part filled with fat.

Fig. 17. Simple and mother cells from the skin.

Fig. 18. Cancer-cells from the pleura.

Fig. 19. Cancer-cells of the muscles, represented with a muscular fibre.

Fig. 20. A group of cells from tumors of the trachea, sparsely mixed with fibres.

Fig. 21. Cells, from the diaphragm.

Fig. 22. Cells, from the mesentery.

Fig. 23. Gray-corpuscles, $\frac{1}{100}$ mil., from the blood.

Fig. 24. Medullary cancer of the vertebral column and of the mesentery. Cancer-cells and inflammation-corpuscles from the bodies of the vertebræ.

Fig. 25. Cancer of the œsophagus. *a–m*. Simple and mother cells. (Obs. 78.)

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[1] This proves that if inflammation occurs after cancer, the exudation is, by no means, converted into cancerous elements.

[2] Both varieties of the mulberry form of corpuscles are here very well seen. (Figs. 10–14.) Those (Fig. 10) composed of proteine and fat are capable of conversion into nucleated cells and fibres; the others (Figs. 13, 14), consisting of pigment-granules, may become enveloped with a cell-wall, but, so far as is known, are not capable of further development into tissues.

HISTOLOGY.

Formation of Cells in Cancer

Pigment

Fig. 1.

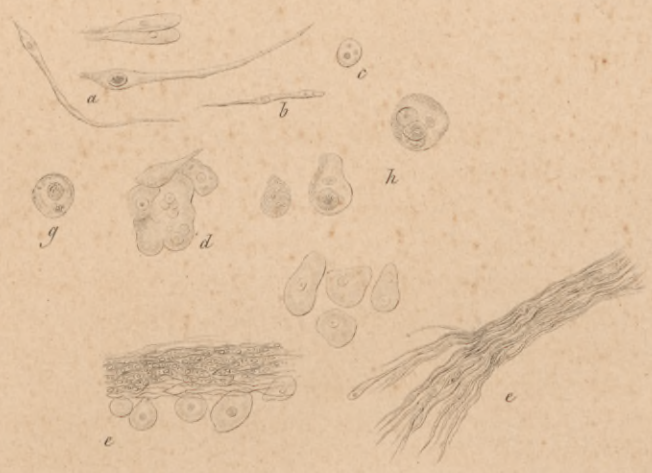
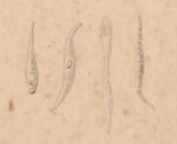


Fig. 2.

Fig. 3.



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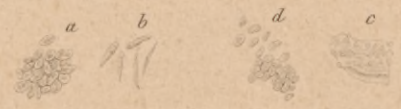

Fig. 5.

Fig. 6.

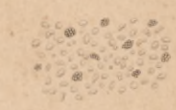

Fig. 7.

Fig. 8.

Fig. 9.

Fig. 10.

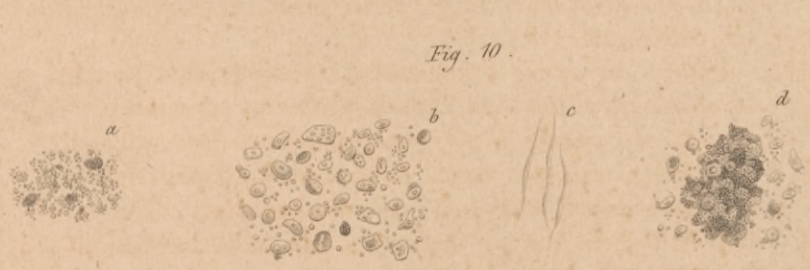

Fig. 11.

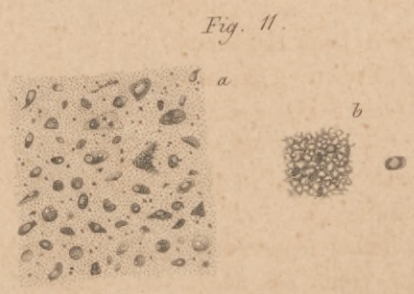

Fig. 12.

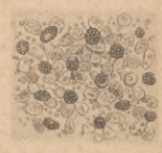

Fig. 13.

Fig. 14.

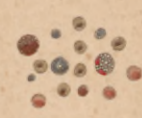

Fig. 15.

Fig. 16.

Fig. 17.

Fig. 18.

Fig. 19.

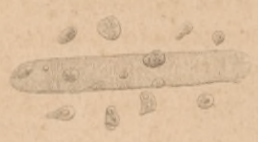

Fig. 20.

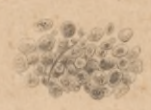

Fig. 21.

Fig. 22.

Fig. 23.

Fig. 24.

Fig. 25.

Vandendale ad nat. delt.

W. Müller sculp.

HISTOLOGY.

Intestinal Glands and Epithelia in Typhus and Scarlatina.

Fig. 1. a.

Fig. 1. b

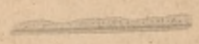

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

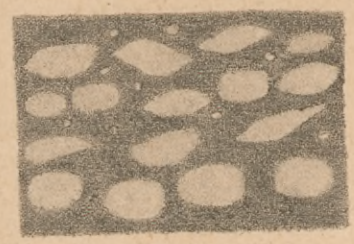

Fig. 8.

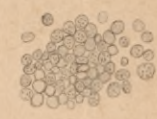

Fig. 10.

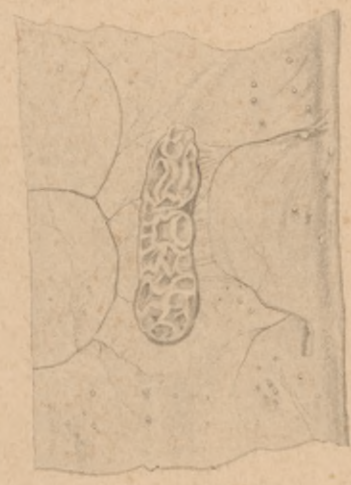

Fig. 11.

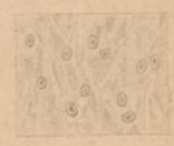

Fig. 17.

Fig. 9.

Fig. 14.

Fig. 15.

Fig. 16.

Fig. 12.

Fig. 13.

Vandendale ad nat. delt.

PLATE VIII.

GLANDS AND EPITHELIA IN TYPHOID AND SCARLATINA. TUBERCLE. GLANDERS. GANGRENE.

Fig. 1. Typhoid fever; first stage. Deposit in the glandulæ solitariæ and gl. agminatæ Peyeri. Ten days after the commencement of the disease. *a.* Surface of the mucous membrane, upon which are visible five vessels which go to the glands still covered by the former. *b.* Vertical section of the gland of Peyer, to show that it is swollen from infiltration. Figures the size of nature. (Obs. 90.)

Figs. 2, 3. Typhoid fever; second stage of the exfoliation of the exudation at its commencement. In a young girl, 15 days after the beginning of the disease.

Fig. 2. The plaque of Peyer, surrounded by the injected and unbroken mucous membrane, appears areolated. The glandulæ composing the plaque are partly deprived of their covering of mucous membrane, and the typhoid exudation is partially emptied. Natural size. At the border of the plaque, the mucous membrane still preserves its villi, as exhibited in a vertical section of the same, magnified 10 times, in Fig. 3.

Figs. 4, 5. Typhoid fever.

Fig. 4. Commencing exfoliation, terminated in Fig. 5, in which the mucous membrane upon the plaque itself is not destroyed, and the positions of the glandulæ are indicated by small openings, and all infiltration has disappeared. From the same intestine; of the natural size.

Figs. 6–8. Typhoid fever, one month after healing. The plaques are exfoliated, the positions of the glandulæ are empty, and are not covered by mucous membrane, while it exists in the interspaces covered with villi.

Fig. 6. Natural size.

Fig. 7. A portion of the same slightly magnified.

Fig. 8. Spherical corpuscles of the whitish liquid which had infiltrated the glandulæ solitariæ of the large intestine. Magnified 255 times.

Fig. 9. Glanders. (Obs. 95.)

a. Pus from abscesses of the skin.

b. A pustule of the skin of the natural size.

c. Pus-corpuscles from a vein.

d. Pus-corpuscles from a lung.

Figs. 10–14. Alteration of the intestinal glands in scarlatina. Exfoliation of the tubuli uriniferi. (Obs. 92.)

Fig. 10. Areolated plaque of Peyer. The glandulæ of the latter are burst and collapsed. An infiltration with exudation is not present. The membranes are easily separated from one another. From the ileum in the vicinity of the ileo-colic valve; natural size.

Fig. 11. Glandulæ solitariæ with a large central opening. From the large intestine; of the natural size.

Fig. 12. A single solitary gland burst open in the centre and collapsed, without exudation, and surrounded by the openings of the follicles of Lieberkühn. Magnified 25 times.

Fig. 13. A portion of an areolated plaque of Peyer, magnified 25 times. The bursted glandulæ, the Lieberkühnian follicles, and the villi are represented.

Fig. 14. Tubuli uriniferi with young nuclei of epithelial cells. Perfect cells were only rarely found, two of which, isolated, are given in the figure. Magnified 255 times.

Figs. 15, 16. Tubercles.

[Tuberculosis is an affection indicated by the deposit in certain organs of a peculiar substance denominated tubercle, which is an abnormal product, at no time existing as a natural constituent of the tissues.

Tubercle occurs either in isolated masses from a mere point to the size of a walnut, or as an infiltration through the parenchyma of an organ. Non-vascular itself, it may exist in any of the vascular tissues; but the internal organs are its most frequent seat.

Tubercle is quite homogeneous, and in its commencement is developed in the interstices of the proper tissue elements from an abnormal plasma effused from the capillary blood-vessels, but, in the course of development and increase, usually a portion of the tissue becomes included, and the capillaries of this are obliterated.

Two varieties of tubercle are generally known, one which is translucent, hard, tenacious, and grayish in color; and a second in which it is opaque, firm, friable, dryish, and yellowish, or yellowish-white. The former variety is found only in small masses, and appears to constitute an earlier condition of the latter; but this, in some organs, commences without being preceded by the translucent variety.

The masses of tubercle, technically called tubercles, receive their nutrition and grow from endosmosing plasma supplied to their periphery by the capillaries of the surrounding parenchyma.

In structure, the translucent variety of tubercle consists of an amorphous, hyaline matter, including irregularly oval or rounded nuclear bodies, containing scattered nucleoli. The

opaque variety consists of granules, nuclear bodies, and fragments of the latter, with a small quantity of amorphous semi-solid matter. The nuclear bodies of tubercle, called tubercle-corpuscles, are the characteristic structure. They are most usually oblong polyhedral, with rounded angles, and measure on the average about the .007 mil. in the long diameter, and .0055 in the short diameter. They consist of a delicate vesicular membrane, with a transparent, amorphous, and colorless, or faintly ambreous yellow, granular liquid, inclosing from two or three to a dozen scattered, globular, transparent, amorphous nucleoli.

From pus-corpuscles, they are distinguished by being smaller and less granular, and from their not having the nucleoli aggregated. Pus-corpuscles also generally are spherical, and usually have not their nucleoli visible until after treatment with acetic acid, while tubercle-corpuscles only become globular by endosmosis of water, or in softening tubercle, and acetic acid influences them very slightly.

From the nuclear structures often found in encephaloid, tubercle-corpuscles may be recognized by the former being larger, regularly oval or not unfrequently spherical, and from their containing one or two nucleoli.

The isolated granules of tubercle resemble very much the nucleoli of tubercle-corpuscles.

According to Preuss,[1] one hundred parts of dry tubercle, previously separated from the pulmonary tissue in which it had existed, presented the following chemical composition:—

Matters soluble in Hot Alcohol.	
Cholesterine	4.94
Matters soluble in Cold Alcohol, but not in Water.	
Oleate of soda	13.50
Matters soluble in Dilute Alcohol.	
A peculiar substance . . . Lactate and sulphate of soda . . Chloride of sodium . . .	8.46
Matters soluble in Water.	
Caseine . . . . . Sulphate and phosphate of soda . Chloride of sodium . . .	7.90
Matters insoluble in Water and Alcohol.	
Caseine altered by heat . . . Phosphate and carbonate of lime . Oxide of iron, magnesia, and sulphur	65.11
	99.91

Tubercles which have once commenced in their development probably never cease action; gradually growing in size by nutrition and aggregation, in which condition they are called crude, they finally undergo softening or transformation. The former phenomenon, or softening, is the most frequent, and ordinarily appears as the most natural course; the nucleolar structures or tubercle-corpuscles dying and undergoing disintegration, commencing in those first produced, and therefore in the centre of the tubercles. These, however, also frequently commence softening at their periphery, in such cases probably being the result of inflammation, induced by the presence of the tubercles in the surrounding parenchyma, which, in the stasis of the capillaries, cuts off the usual supply of the tuberculous plasma.

Softened tubercle resembles thick pus, and has a pasty consistence, or consists of a thin, watery liquid mingled with cheese-like flakes. In structure, it consists of liquid, large quantities of granules of various sizes, groups of connected tubercle-corpuscles, others of the latter isolated and more rounded than in the crude state, and fragments of the same bodies. Sometimes it also contains fibres or portions of the parenchyma which had been involved in the tubercle.

The surface of the cavity containing the softened tubercle separates pus, or becomes a pus-producing membrane, and hence pus-corpuscles are a frequent constituent of softened tubercle, as are also sometimes inflammation-corpuscles. When the cavity communicates with a mucous surface, the peculiar epithelial cells of the part become mingled in the softened tubercle.

In the transformation of tubercle, it becomes gradually desiccated, and assumes the cretaceous condition, when it consists of granules, remains of tubercle-corpuscles, and frequently cholesterine crystals, and occasionally pigment-granules. The chemical composition of cretaceous tubercles consists of cholesterine, a small quantity of phosphate and carbonate of lime, and a large proportion of chloride of sodium and sulphate of soda.—TRANS.]

Fig. 15. A lacteal of the small intestine, filled with tubercle, of the size of nature.

Fig. 16. A portion of the surface of the lung, the air-cells of which were filled with tubercle, and thus imitated a pneumonia. Magnified 25 times, and viewed by reflected light. From a man 23 years of age. In this case there were thousands of miliary tubercles thickly crowded in the lower lobe of the lung, while at the apex of the same, and in the bronchial glands, only a few crude and calcified tubercles were observed. The intercellular spaces of the air-cells were filled with innumerable inflammation-corpuscles.[2]

Fig. 17. Dissolution of muscular fibres in moist gangrene.[3]

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[1] Dissertat. Inaug. Tubercul. pulmonis crudorum analysis chemica. Berol. 1835.

[2] Rainey (*Medico-Chirurg. Trans.* vol. xxviii.) is not the only person who has recognized the membrane of the air-cells in miliary tubercles, as Henle (*Rat. Path.* p. 789) believed, for I had indicated (*Path. Anat.* Lief. xv. 14), the existence of a membrane, still invested by its epithelium, surrounding miliary tubercles, and have represented their cluster-like form in Pl. III. Figs. 11, 12.

[3] Copied from my inaugural dissertation.

HISTOLOGY.

Glands and Epithelia in Cholera.

Plate IX.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 7.

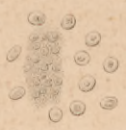

Fig. 6.

Fig. 5.

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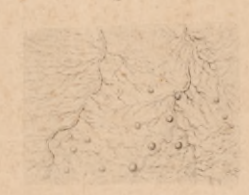

Fig. 8.

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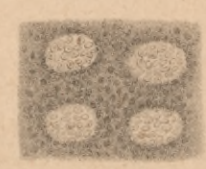

Fig. 13.

Fig. 14.

Fig. 15.

Fig. 19.

Fig. 16.

Fig. 17.

Fig. 18.

Fig. 20.

Fig. 21.

Fig. 22.

Fig. 23.

Fig. 24.

Fig. 25.

Fig. 26.

Vandendale ad nat. delt.

W. Müller sculp.

PLATE IX.

GLANDS AND EPITHELIA IN CHOLERA.

Figs. 1–3. Intestinal glands in cholera.

Fig. 1. Portion of small intestine with swollen solitary glands and a gland of Peyer, from a woman of 45 years of age.

Fig. 2. Glandulæ solitariæ of the small intestine, from a boy 10 years old.

Fig. 3. Glandulæ solitariæ of the large intestine burst open at their centre, from a woman 45 years of age. Natural size.

Fig. 4. Portion of healthy small intestine, with glandulæ solitariæ, for comparison, from a man of 60 years of age, who died suddenly at the hospital from apoplexia meningea.

Fig. 5. Epithelia from a creamy mucus of the urinary bladder in cholera.

Fig. 6. Gland of Peyer reticulated and covered by its villi, which have lost their epithelia, from a girl 6 years old, who died eighteen hours after an attack of cholera. Natural size.

Figs. 7–12. From a woman, 35 years of age, who died twelve hours after an attack of cholera.

Fig. 7. Epithelia observed in a cream-like, albuminous liquid, expressed in considerable quantity from the tubuli uriniferi.

Fig. 8, *a*. A uriniferous tubule from the cortical substance. *b*. Malpighian capsule from the latter, covered with separated epithelial cells.

Fig. 9. An intestinal villus deprived of its epithelium. Magnified 255 times.

Fig. 10. A portion of intestine with the villi and follicles of Lieberkühn devoid of epithelium. Magnified 25 times.

Fig. 11. Portion of small intestine. Magnified 255 times. Three follicles of Lieberkühn are represented, in which the epithelium in various degrees is thrown off.

Fig. 12. Follicles of Lieberkühn of the large intestine, the epithelium exfoliated, and filled only with roundish nucleated cells.

Fig. 13, *a*. Epithelial cells from the greenish mass of the stomach vomited in cholera. *b*. A flake of epithelium and isolated epithelial cells, from the contents of the small intestine. *c*. Epithelial cells from the contents of the urinary bladder. The fusiform appearance of some of the cells arises from their being folded and viewed upon their margin.

Fig. 14, *a*, *c*. Cell-nuclei, from $\frac{1}{200}$ to $\frac{1}{125}$ mil. diameter; and *b*, epithelial cells, from the contents of the small intestine.

Fig. 15. A villus, with the exception of a single cell, deprived of its epithelium.

Fig. 16. Nuclei, from the milky contents of the glands of Peyer, being about the size of blood-corpuscles.

Fig. 17. Flocculent contents of the stomach, consisting of partially decomposed epithelial cells.

Fig. 18. Blood-corpuscles with the so-called lymph-corpuscles. The former were pale, without visible nucleus; the latter were twice as large, spherical, granulated upon the surface, and had several nuclei or a single one. From the heart.

Fig. 19. Fibrine, almost entirely granular, with lymph-corpuscles of various sizes.

Fig. 20. Flakes from the black, albuminous bile, consisting of pigment-granules.

Figs. 14–20. From a woman who died of cholera.

Fig. 21. Discharge from the bowels of a woman, attacked since two days with cholera. The discharged matter was liquid, flocculent, viscid, grayish-brown, not acid, and contained only cell-nuclei of $\frac{1}{110}$ mil. *a*, or larger nuclei *b*, resembling pus-corpuscles.

Fig. 22. Cholera stool from a man on the first day of the disease. The rice-water-like liquid separated into a sediment consisting of nuclei, and a serum strongly coagulating with mineral acids.

Fig. 23. From a drunkard, 69 years of age, thirteen hours after death. The reddish-colored contents of the large intestine contained flakes, which consisted of fragments resembling villi deprived of epithelium *a*, and numerous nuclei *b*.

Figs. 24–26. Normal uriniferous tubules invested with their epithelium, from a new-born child. Represented for comparison.

Fig. 24. Uriniferous tubule from the cortical substance, in which the cell-nuclei of the epithelium alone are visible, and not the cell-walls, on account of their great degree of transparency.

Fig. 25. Cells from the milky liquid expressed from the papillæ renales.

Fig. 26. Tubulus uriniferus of the medullary substance, in which the walls of the epithelial cells are more visible.

PLATE X.

ENTOZOA.[1]

Figs. 1–5. *Ascaris lumbricoides;* or large round worm of man.

Fig. 1. Female, opened. Natural size.

Fig. 2. Upper view of the head, slightly magnified, exhibiting the three lobes which surround the mouth.

Fig. 3, *a*. Eggs from the uterus.

Fig. 3, *b*. Earliest formation of the eggs through the aggregation of fat-like granules, by an albuminoid liquid, from the ovary.

Fig. 4. Posterior extremity of the male, natural size. The penis, which is represented partially protruded, is double.

Fig. 5. Do. slightly magnified.

Figs. 6, 7. *Tricocephalus dispar*, or long thread-worm.

Fig. 6, *a*. A male of the natural size, nearly two inches in length.

Fig. 6, *b*. Posterior extremity of the same, magnified.

Fig. 7. A female of the natural size.

Fig. 8. *Oxyuris vermicularis*, or short thread-worm; seat-worms, ascarides. From the rectum usually.

Fig. 8, *a*. Female, natural size.

Fig. 8, *b*. Head, magnified 25 times; inverted in the figure.

Fig. 8, *c*. Eggs.

Fig. 9. *Tænia solium*, or tape-worm. (Common in Germany, France, and England.)

Fig. 9, *a*. Youngest and anterior part of the body.

Fig. 9, *b*, *c*. Posterior and older part of the same.

Fig. 9, *d*. Cephalic extremity; natural size.

Fig. 9, *e*. Head slightly magnified. Of the four bothria, two only are visible in the figure.

Figs. 10, 11. *Bothriocephalus latus*, or broad tape-worm. (Common in Switzerland, Russia, &c.) The figures have been kindly contributed by Prof. Valentine, of Berne.

Fig. 10. A number of segments, of the natural size.

Fig. 11. A pair of segments magnified, exhibiting interiorly the generative apparatus.

Fig. 12. Head of *Tænia plicata*, from the small intestine of the horse. Imparted by Prof. Valentine.

Figs. 13, 15. *Distoma hepaticum*, or the liver-fluke. From the liver of the sheep. The same species, and also the D. lanceolatum, occur occasionally in the human liver.

Fig. 13. Dorsal view; natural size.

Fig. 14. Ventral view; natural size.

Fig. 15. An egg, in which the germinal vesicle has already disappeared.

Figs. 16, 17. *Cysticercus cellulosæ*, from the muscle of a man. Communicated by Prof. Spring.

Fig. 16. A pair of separated cysts which contain the worm.

Fig. 17. A single cyst imbedded in a portion of muscle.

Fig. 18. Eggs of entozoa (Tænia?), which are not unfrequently found in the liver of the rabbit. The groups of ova formed soft, gray-colored, tubercle-like masses, from the size of a pea to that of a nut, and were formerly mistaken for cancer. In the liver from which the eggs were taken, there existed no trace of a developed entozoon. The eggs measure 0.03 mil. long.

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[1] I present here views of the most important entozoa and other animal parasites and epiphytes, for the most part original. A history of entozoa was less practicable; for, according to the latest authorities, an entire consolidation of former divisions has become necessary. The entozoa must cease to form an especial zoological order, and several of them are now known to be only different stages of development of the same animal. The Cysticercus is only a young Tænia, and this is only a trematode worm without a digestive apparatus. The Acephalocysts and Echinococci also appear to be only steps of development of Cysticercus. See *Bull. de l'Acad. des Sciences*, No. XII., Bruxelles, 1849, p. 697; and particularly the large work of Van Beneden, just appeared in the *Mém. de l'Acad.*, Bruxelles, 1850.

ENTOZOA.

Fig. 1.

Fig. 2.

Fig. 3. a.

Fig. 3. b.

Fig. 4.

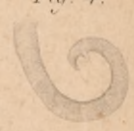


Fig. 5.

Fig. 6. a.

Fig. 6. b.

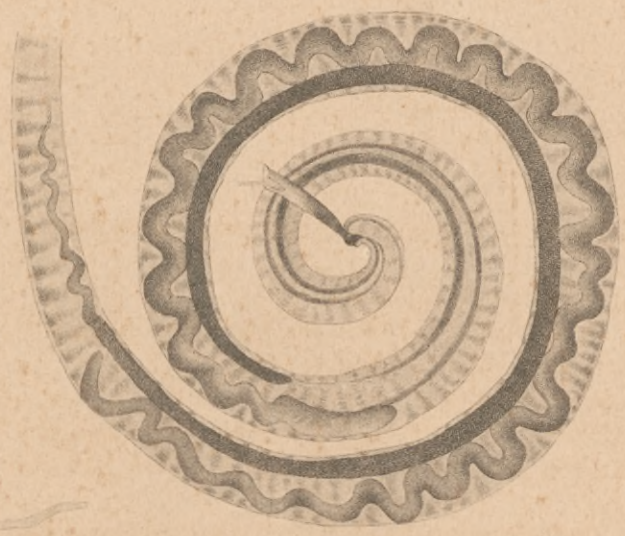


Fig. 7.

Fig. 8. a.

Fig. 8. b.

Fig. 8. c.

Fig. 9. a.

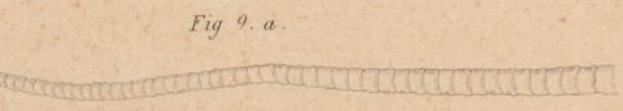
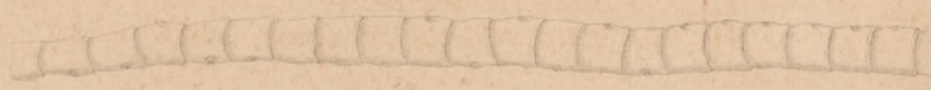


Fig. 9. b.



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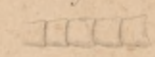

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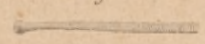

Fig. 9. e.

Fig. 10.

Fig. 11.

Fig. 12.

Fig. 13.

Fig. 14.

Fig. 15.

Fig. 16.

Fig. 17.

Fig. 18.

Vandendale ad. nat. delt.

PLATE XI.

ENTOZOA.

Figs. 1–3. Echinococcus hominis and acephalocysts, associated with encephaloma. A woman, 62 years of age; jaundiced, likewise, in consequence of a former rachitis, had a scoliosis of the vertebral column, and swelling of the left tibia, which was otherwise healthy; died on the 15th March, 1848, of medullary cancer of the liver. In July, 1847, she was treated for catarrh of the lungs, by Dr. Lequime, in the Hospital of St. John, and at that time presented no symptoms indicating degeneration of structure in any of the organs. The skin was ochre-yellow. The intestines, even the small intestine, were distended with pale, hard feces. The stomach contracted into two sacs. Both lungs attached by their apices to the pleuræ costales, and in this position exhibited the traces of retrograded tubercles. At the surface of the liver and in its substance were found numerous tumors of medullary cancer, and on the under surface of its right lobe a fluctuating encysted tumor filled with soft, yellowish masses consisting of decomposed hydatids. The gall-bladder was not distended, and contained biliary calculi and inspissated bile. The ductus choledochus was closed by an encephaloid tumor. The hepatic ducts were visibly dilated. In the left iliac fossa within the peritoneal cavity was a large tumor, reaching up beneath the false ribs. This tumor consisted of a larger and a smaller cyst which did not intercommunicate. The upper one pressed upon the lower border of the left kidney, which was thereby somewhat diminished in size. The lower cyst was supported upon the os ilium. The former was somewhat rough upon the surface, the latter throughout smooth. Both cysts were composed of a thick fibrous membrane, and contained hundreds of clear, translucent, bluish or whitish sacs from the size of peas to that of goose-eggs, which, when laid upon the hand, presented characteristic trembling movements. Each of these sacs or hydatids was composed of a membrane consisting of a number of concentric layers. The larger hydatids sometimes contained smaller ones within, and sometimes a smaller hydatid was situated upon a larger one externally, thus presenting endogenous and exogenous (budding) formation. The contents of the hydatids was a clear liquid, in which were swimming only fat-granules, or cells filled with these. The latter cells invested the inner surface of the hydatid sac, the walls of which were not fibrous. Sometimes the hydatids contained some albuminoid flakes, consisting of simple nucleated cells, $\frac{1}{25}$ mil. in diameter, and cholesterine crystals. No trace of cephalic hooks or calcareous bodies was observed in any of the hydatids, which are therefore to be viewed purely as acephalocysts. On the contrary, in the hydatid sac of the liver, there were still found a few perfect echinococci with hooks, and containing cells filled with calcareous corpuscles. It appears from this case that echinococcus and acephalocyst hydatids, are only two forms of development, of which the latter precedes the former; an opinion which I have formerly expressed. Moreover, the structure of the wall of acephalocysts is so characteristic, that they cannot be mistaken for any other pathological structure, even when they contain no echinococci.

Fig. 1, *a*. Three acephalocysts, not containing echinococci; natural size.

Fig. 1, *b*. Two opened, which inclosed a number of others; natural size.

Fig. 2, *a*. Laminated membrane of the hydatid sacs, lined with fat-granules, and cells filled with the same, which latter constitute buds for the formation of new sacs. *b*. Separated nuclei. *c*. Nuclear cells, which probably precede the granule-containing cells. Magnified 255 times.

Fig. 3. From the hydatid of the liver which contained echinococci. *a*. An echinococcus, which incloses a number of cells filled with calcareous granules (retrograded buds?). The cephalic hooks are also observed upon the surface. *b*. Cholesterine crystals, mulberry-formed corpuscles, constituting the first deposit for the formation of cells, some fat-granules, and hooks. Magnified 255 times.

Figs. 4–7. Echinococcus of the camel (*C. bactrianus*). The animal died from a hemorrhage in the abdomen induced by softening of both kidneys, which were almost liquefied and of a very yellow color. The tubuli uriniferi were distended with fat-granules. Acute softening of the kidneys through stearosis. A few calcified tubercles in the lungs. Several hydatid sacs were found in the somewhat granulated fatty liver. The sacs were composed of a capsule of areolar tissue inclosing a second membrane, which was transparent and structureless, and covered upon its inner surface with fat-granules. The cavity of the cyst either contained a clear serum, with yellowish-white flakes partially consisting of vesicles with transparent walls filled with fat-granules, resembling yelk globules; or it inclosed a number of smaller cysts of various sizes, containing a clear serous liquid without albumen, or a

cloudy albuminous liquid. The latter consisted of a gelatinoid mass containing either fat-granules and hooks of echinococci, or perfect echinococci, but of perhaps about 40 cysts only two had these animals or their hooks within them. In the same cysts were also observed hydatids, or true acephalocysts, and such in which echinococci had been developed. One of the hydatids was calcified. The probable course of development of hydatids is also indicated in these figures.

Fig. 4, *a*. A large mother-sac inclosing smaller ones; natural size.

Fig. 5. Several cysts, hardly visible to the naked eye, which had their origin by buds from the inner surface of a mother-hydatid. Slightly magnified.

Fig. 6, *a*. Fat-like granules which covered the inner surface of all the cysts, whether these contained echinococci or not; *b*, *c*, laminated membrane of the cysts; *d*, *e*, *f*, *g*, formation of new cells or buds which are converted into hydatids. *d*. Represents the fat-like granules already united into groups; *e*, a large segmented mass, like the yelk of the egg in the condition of segmentation, beginning to form vesicles; *f*, vesicles isolated; *g*, appears to be a young, perfectly-formed hydatid. Magnified 255 times.

Fig. 7, *a*. An echinococcus, with two vesicles (buds) filled with granules, formed at the lower part of the body; *b*, a perfect echinococcus with the oval circle of hooklets, and on each side the bothria; *c*, a third individual from which two young ones are on the point of separating; *d*, fat-like granules from the inside of the hydatids, and oral hooklets of echinococci, which measure the $\frac{1}{50}$ mil. long. Magnified 255 times.

The progress of development, therefore, appears to be thus: 1. From the inner surface of acephalocysts, hydatids, or simple sacs, granules become isolated, which aggregate themselves together and become converted into vesicles. Then these are separated from the inner surface of the wall of the mother-hydatid, and remain in this condition, or are developed into echinococci with their oral hooks, etc. 2. In the body of echinococci also vesicles are formed like those just indicated, which, without being able to follow the steps of development, probably remain as simple vesicles or acephalocysts, or become converted into echinococci.

Figs. 8–10. *Trichina spiralis*, copied from Vogel and Owen.

Fig. 8. A portion of human muscle thickly sowed with the trichina spiralis; natural size.

Fig. 9. A trichina cyst with calcified walls. Magnified 20 times.

Fig. 10. Trichina spiralis isolated from its cyst. *a*. Cephalic extremity; *b*, tail end. Magnified 200 times.

Fig. 11. A trichina cyst torn open, and the worm with its surrounding granular substance escaping from the rupture. Magnified 20 times.

Fig. 12. A cyst inclosing two trichinæ. The extremities of the cyst are more elongated than ordinarily. Magnified 20 times.

Figs. 13–16. Strongylus gigas of the kidneys. Found in the horse, ox, dog, and man. Copied from Gurlt.

Fig. 13. Female of the natural size.

Fig. 14. Cephalic end, magnified. The mouth is surrounded by six flattened papillæ.

Fig. 15. Caudal end of the male, magnified. The undivided caudal sac incloses the anus, from which projects the penis.

Fig. 16. Young worms, magnified.

Fig. 1.

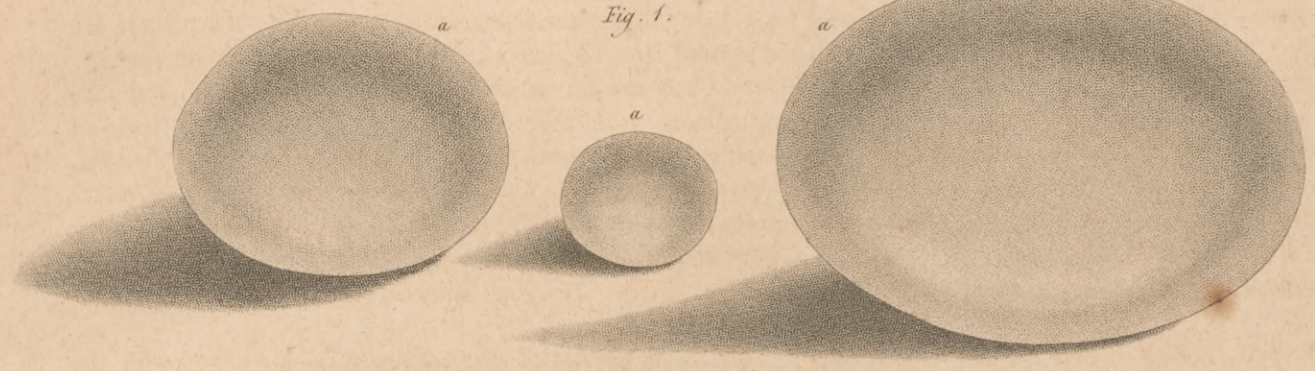

Fig. 1.

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Fig. 7.

Fig. 8.

Fig. 12.

Fig. 11.

Fig. 10.

Fig. 9.

Fig. 13.

Fig. 14.

Fig. 15.

Fig. 16.

PLATE XII.

ENTOZOA, EPIZOA, EPIPHYTA, ETC.

Figs. 1–6. *Cysticercus cellulosæ*, from the human brain. Kindly imparted by Dr. Lebert.

Fig. 1. The cyst which incloses the cysticercus; natural size.

Fig. 2. The body of the worm rolled up in its caudal sac.

Fig. 3. The worm unfolded, in which the head, body, and caudal vesicle are seen.

Fig. 4. Head, with four bothria and a corona of hooklets.

Fig. 5. The transversely-folded body.

Fig. 6, *a*. One of the folds or segments, magnified 480 times, exhibiting calcareous bodies within; *b*, some of the latter isolated.

Fig. 7. An echinococcus with distinct lateral bothria, from a man. Generally there are four of the latter. Imparted by Dr. Lebert.

Fig. 8. *Acarus folliculorum s. comedonum*, from the sebaceous glands of the nose. *a*, *b*. Ventral view; *c*, dorsal view. Magnified 255 times.

Figs. 9, 10. *Sarcoptes hominis*—vulgarly, *itch-insect*. Magnified nearly 100 times. Copied from Simon.

Fig. 9. Dorsal view.

Fig. 10. Ventral view. *a*, *b*. Bristles upon the head; *c*, jaws; *d*, *e*, suctorial disks; *f*, *g*, anterior extremities; *h*, posterior process.

EPIPHYTA, OR VEGETABLE PARASITES.

Fig. 11. *Torula cerevisiæ*—yeast fungus. In the form of sporules.

Figs. 12–16. *Sarcina ventriculi*, from the human stomach. After Frerichs. The mode of development of this plant is as follows: at first, round cells originate, measuring $\frac{1}{400}$ of a line in diameter, mostly isolated, but sometimes united in a pair. In the middle of each cell there appear two lines forming a cross, in the direction of which the cell becomes divided into four parts, as seen in Figs. 12, 13. From these more compound forms originate through further division, as in Figs. 14, 15. In some specimens a granule appears in the middle of each square, as seen in Fig. 16.

For comparison, I have represented in Fig. 23 the division of Gleocapsa. This single-celled plant (*a*) which has a nucleus, increases itself through the partition of the latter into two (*b*) and into four (*c*). But, as remarked by Frerichs, sarcina does not reproduce by the partition of a nucleus, because this is not originally present.

Figs. 17, 18. Fungus plant of Tinea favosa.

Fig. 17, *a*. Favus crust, viewed upon the free surface, in the centre of which is a small pit or depression, natural size. *b*. The same magnified, in which the fungous spores give it a granular appearance. *c*. Magnified 400 times, and representing the primitive cells or spores, which, in a number of cases, have become elongated into filaments by the formation of sprouts. *d*, *e*. Granules intermingled with the preceding, which appear to be very young small spores of the same.

Fig. 18, *a*. Spores and (*b*) filaments of the favus plant. Magnified 400 times.

Fig. 19. In a single instance I found the favus alga, mixed with the ordinary fungus, in a crust of favus moistened with distilled water. The algous plant consists of sacs filled with greenish-colored granules, with and without a structure of cells. *a*, *b*. Presents the first development of this plant; *a*, magnified 55 times, *b*, 255 times. *c*, *d*. Further development of the same, magnified 55 and 255 times.

Fig. 20. Alga of the mucous membrane of the mouth, magnified 255 times. The thread-like sacs are rooted in a granular mass. These are found very frequently in the normal condition of the mouth between the teeth.

The following figures could not be got in their proper places in the preceding plates. They relate to the retrogradation of cancer and goitre. For the former, see Obs. 96.

Fig. 21. Fibrous metamorphosis of cancer. Branched fibres are observed with granules in the interspaces; from the tumor which contained only a serous liquid.

Fig. 22. Commencement of the formation of fibres in one of the tumors, which already appear fibrous, but yet still contain the peculiar liquid of cancer. *a*. Cells of the same. *b*. Commencing formation of fibres.

Fig. 24. Cells from the cortical substance of the kidney infiltrated with cancer liquid.

Figs. 25–28. Goitre. The middle lobe was converted into a cyst the size of an apple, with the inner surface smooth

and invested with polygonal cells. It contained a blood-red serum, and at bottom a soft, yellowish, flocculent substance, which consisted of cells filled with granules and rarely exhibiting a nucleus, as represented in Fig. 25, *a*. The vesicles of the left lobe were but slightly separated from one another. They were reddish, and soft gelatinoid, and their primitive cell-wall had disappeared, so that the gelatinoid masses were free in the meshes of the fibrous stroma. These masses contained roundish cells with granules, as in *b*, or polygonal cells with a simple, double, or triple nucleus, as in *c*. Sometimes inflammation-corpuscles and cholesterine crystals, Fig. 26, were observed intermixed. In the right lobe, the commencement of degeneration could be plainly perceived. The glandular vesicles were still hard, but already of the size of the head of a pin, as represented in Fig. 28, of the natural size. When eight times magnified, the enlarged vesicles were easily visible, and through their transparent wall young cells could be seen, as in Fig. 27. The enlarged vesicles measured the $\frac{1}{6}$ to the $\frac{1}{3}$ mil. Through a high magnifying power the vesicular contents appeared gelatinoid with imbedded nuclei and cells. In these cases, a gelatinoid conversion of the contents of the enlarged vesicles takes place, and nuclei and cells are formed, and at a later period the walls of the vesicles disappear, and the gelatinoid masses, with their nuclei and cells, lie free in the meshes of the fibrous stroma.

The simple hypertrophic form of goitre with the formation of cysts, I have also observed in the horse. (See *Repert. de Méd. Vétér.* Bruxelles, 1850.)

THE END.

ENTOZOA

Epizoa, Epiphyta, etc.

Plate XII.

Fig. 1.

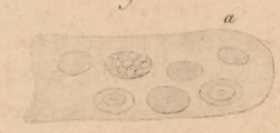
Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.



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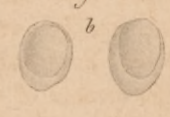

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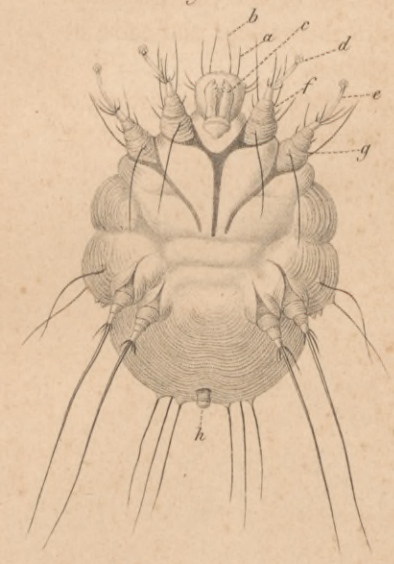

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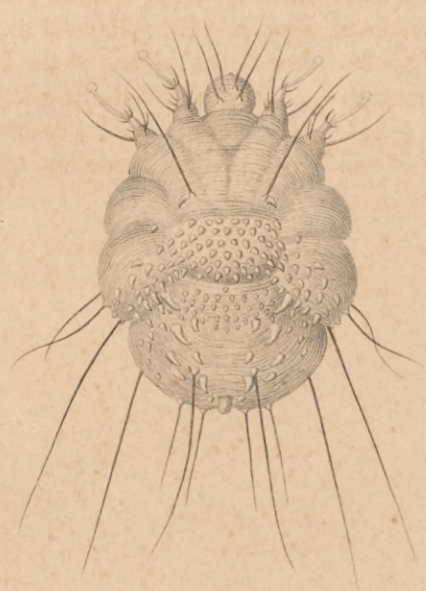

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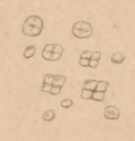

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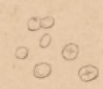

Fig. 17.

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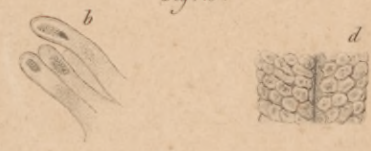

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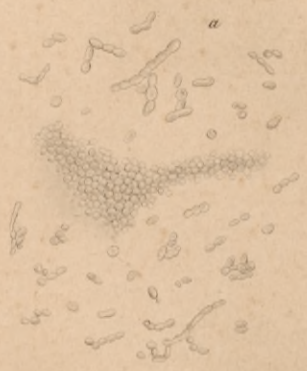

Fig. 18.

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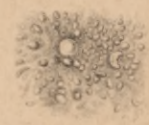
Fig. 25.

Fig. 26.

Fig. 27.

Fig. 28.



Vandendale delt.

W. Müller sculp. Weimar 1850.

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