A Contribution to the Pathology of the Cell.

A Thesis for
The Degree of Doctor of Medicine
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I certify that since my graduation as M.D. & M.R.C.P. in 1890 I have been engaged in general practice.

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Ab. 1894.
Weber has likened said 'Pathology is Physiology.
Pathology is ever at hand, visible from our very birth, there is always present that physiological degeneration of tissue that attends every act of life, which by a merciful Providence is held in abeyance during the period of growth and development but begins to assert itself more and more as the period of maturity advances to that of decline, till ultimately it reigns supreme in death.

Sirisane (last book of medicine) says, "It has been pointed out that every act of life is attended with waste of tissue and living protoplasm which is essentially unstable and short-lived. It must never be forgotten that atrophy and degeneration in organs and tissues are normal physiological processes of old age and that somatic death in which they culminate is the normal termination."

How easy under the conditions of civilised life amongst which we are now living for this physiological degeneration to become
formative and so enter the domain of
pathology—As Browning puts it

"how prone is nature

Repose the flesh through too much heat and strain
Whereby the wily vapour from comes ship
Book and rejoin its source before the time."
The diseases that flesh is heir to may be
indeed book through their complicated
pathological phases to a simple derangement
of the normal physiological cellular metabolism,
having their very essence in a perversion
of the normal metabolism of the simple cell.
Brislouw says, "If we carefully consider the
ultimate processes of disease we cannot
fail to recognise the fact that they con-
sist essentially in the nutritive modification
of the protoplasmic and vital element of
the tissues—that under the influence of
abnormal or unwonted stimuli these en-
large multiply, differentiate, that when
insufficiently stimulated or fed or acted on
by destructive agents they undergo atrophy
or degeneration a perish of that as a
necessary consequence of such changes
their functional attributes become heightened

or unperceived, or more a little profoundly modified."
We do not need to travel with the Darwinian
Theory via nuer or to the amoeboid protoplasmic
Cells more; through our own painfully and
wonderfully constructed complexities we can
and must to comprehend their physiology
and pathology might have looked in humility
at the simplicity of the single cell, magnificent
in its very simplicity. Sir Haliburton in his
Geologist's Lectures (1893) writes: "In the
higher animals, certain cells are set apart
especially to perform one function, certain
other cells to perform another. Some for
instance are concerned in muscular
contraction, others in elaborating secretion,
others in reproduction and so forth. But in
such an animal as the Amoeba
do the functions movement, secretion,
digestion, excretion, and multiplication are
performed by one cell. In the higher
animals, the various functions are unravelled
from each other, but in the Amoeba,
looking at its apparently simple structure,
it is difficult to realise the potentialities
of and the varieties of function intricably
The little mass of living jelly in the fertilized ovum of one of the higher animals we have a no less wonderful potentiality: when this simple structure extends and multiplies so that the volume it possesses not only powers of multiplication but also powers of directing the arrangement and subsequent changes in the cells so produced to form the complicated organs of the adult. In addition to this, like the offspring resembles the parent in appearance and often in the subtle qualities such as instinct, mental disposition, and even in the tendency to certain diseases like fevers, lues, and cancer. All these potentialities must have been present in the original ovum from which the rest of the body is formed.

Virchow (Harveian Oration 1893) says—

"Since the third decade of this century, the microscope has disclosed the existence of cells, first in plants and very soon afterward in animals. Only living beings contain cells, and vegetable and animal cells show so much similarity of structure that we can demonstrate in them the actual product of
of organisation - this connation has become general since through our embryologist especially, through Schwann's Prof. has been afforded that the construction of embryonic tissues was derived from cells also, in the highest animals and in man himself. "Borstein says: "The vital elements of the organism are the protoplasmic masses or nucleated cells which thickly disseminated carry on between them all the living functions. These form the universe network of connective tissue corpuscles, the laminated aggregations constituting the various epithelia and endothelia and the axles of capillary vessels and lymphatics, the mosaic accumulations observed in the central nerve organs, liver, lymphatic and other glands, protoste, striped muscle, fibre and the axis, cylinder and peripheral end of nerves, and locally corpuscles which are free in the circulating fluid. The development growth and maintenance of the entire organism depend on the healthy circumstances as to nutrition and the like of the protoplasmic elements which constitute its living parts." The earliest integral characteristic of the cell is
its inherent power of growth - it takes up from nutritive material supplied it what it requires for this purpose building it up into its most intimate structure and so increasing its size and weight; but even at this early stage there is decay, at the same time with this incessant growth and supply there is an equally incessant process of waste and decomposition - but at this stage this process is minimal; there is enough to spare for repair, and so growth takes place not only growth but elaboration and complexity. This goes on until the boundary line is reached, the period of maintenance becomes established which in turn gives place to that of decline and degeneration during which period destructive metabolism (Katabolism) is on the ascendant and continues so more and more until at last death closes the metabolic scene. Dalton in his work on Physiology says: "The history of a living animal or plant is a history of successive epochs in phases of existence in each of which the structures and functions of the body differ more or less from those of every other. Each living being has
a definite law of life, through which he passes by the operation of an irremovable law, and which at some regular, appointed time comes to an end and the plant germinates, grows, blossoms, bears fruit, wither, and decays. The animal is born, nourished and languishes to maturity, after which he retrogresses and dies. The very commencement of existence by passing through its successive intermediate stages, and yet at last necessarily to its own termination." So much for the formed material of which the organism is composed besides this, however, there is the plasma that bathe the tissues, supplying them with nutritive material and carrying away waste products. This forming such an important rôle in the metabolic processes. Defendine in an article in an American journal on the Microbic Nature of Pulmonary Consumption, write: "The cell, of which the higher organisms are composed live in the intercellular fluid and lymph which bathe them. This nutritive fluid is continually being removed by veins and lymphatics. Besides this, an interchange of gases and of solids (internal respiration) takes place by diffusion between lymph and the blood.
and it is only while the blood is passing through the capillaries that the interchange
between the lymph and the blood can take place. The function of an organ depends
in a great measure on the integrity of the capillaries.

We will be forcibly impressed with the
importance of maintaining the metabolic
processes in a state of health, if we con-
sider that we are physiologically but also
pathologically processes may be traced back
through their complexity to the simplicity of
all metabolism. The pathologic being an
impairment of the physiologic balance of
nutriment. Disease is not as it has been regarded in times past a dise
entity entering the body and taking up
its course like an evil spirit requiring
to be exorcised but simply (and there is
simplicity in the very simplicity) a discord
in the divine harmony of healthy metabolism
and its harmonious relation with the outer
world. Sir Henry Sutton said "To say
that a man is healthy means that he
goes well in everything - a healthy man
does not know what he has got a stomach; that
part of his body is working very hard and he is
healthy in hopeless ignorance. Then he stays
indoors too much, keeps out of the sunshine.
He cannot assimilate his food and gets
a pain in his stomach; he is diseased.”

The more our knowledge of the early stages
of pathological processes becomes evident
the more wise we will become prophylactic and
the better will become our prophylactic
measures. The idea that every practitioner
must be struggling for is a more and more
different prophylaxis. - Prophylaxis cannot
be in this world; but until we have forced
from these realms of man’s “nothing perfect”
is there is good “acceptance” but it is the aim
to which each of us must be conscientiously
working and already much has been done.
and there is every reason to hope that more
and more will yet be accomplished – the
class of acute diseases will become more
more narrowed down till many of them
indeed will appear as almost chronic in
character. We will see them no longer in
their advanced stages of acuteness but only
in their early stages; may more be hoped in time to recognise them as one evil potentialities in the case, which may be hidden in the bud. The Smith has well shown that certain acute illnesses, however readily they may progress for a considerable time before their acute manifestations, have instances acute commencement and point out their bases in past medical evidence of changes in the lungs; their must have been no progress for a considerable time prior to the acute outbreak. Professor D. H. S. Balfour and his work on disease of lungs offer us expressions similar views. One of the greatest teachings of Dr. Philip of Edinburgh is to strive to recognise pulmonary tuberculosis in its incipient stages as the boys consolidated and cavities formation do not take place all at once.

Now a more must be recognised the appearance of disease on an impairment of these fundamental nutritive metabolic processes of a more or less indistinguishable character. The former postulates great lesions which in his French School of Organism referred to by Virchow in his Harvocain.
was considered the essence of the work, and in the new regard as a comparatively advanced stage of the pathological process, and in our treatment must seek to direct our therapeutic measures towards a restoration of the early widespread function of the lung in which the disease has originated.

The late Sir Henry Sutton said, "At the beginning of the disease it is functional; it is then that it is most important to recognize it. If we can recognize the onset of phthisis at this stage before there is any organic destruction of the lung, we can cure it with ease and quickness. If we recognize it in the early stage that phthisis is coming on, we can forestall it by years. The advances of medicine will be in recognizing these and in the treatment of functional failure, and we shall save people from organic destruction."

Sir J. Russell Reynolds (System of Medicine) says:

"When we find material changes in association with functional disturbances, the theory that many of the latter are indirectly to what we see of the former, the more numerous and important of them being dependent upon"
Upon what we do not see, viz. the finer changes in the intestinal processes of nutrition."

Dr. McKenzie writing in the Therapeutics of Exercise in the Montreal Medical Journal (Feb, 1894) says: "The most fertile soil for the insidious monster is a young and debilitated organism in which the life processes are slow and weak; may we not in our eagerness to destroy these insinuating sources of disease by medicine, which are too apt to encroach on the patient in a common fit be apt to neglect the best protective measure we have because the most under our control. I refer to the bearing of a strong and healthy army, of phagocytes, begotten of good food, sufficient rest and plenty of exercise." The most recently expressed views on the subject of inflammation have done much to enable us better to understand the mechanism of cellular metabolism and with its diseased processes in general. They have been expressed by Prof. May of Cambridge in an Address at the British Medical Association 1893 thus:

"I must remind you that the much abused
In inflammation can no longer be so freely used as has hitherto been the case, and that we must now exclude from this species many pathological processes which in the past have been considered and called inflammation. For instance many of the so-called interstitial inflammations are now known due to local anemia from narrowing of the blood vessels or other causes whereby the blood supply is rendered insufficient to maintain the relatively active metabolism of certain tissue elements which are replaced by fibrous tissue whose nutritive changes are less active. The same is the case with most if not all of the parenchymatous inflammations which are mostly due to malnutrition or to chemical destruction of the functionally active tissue elements and which in many cases lead to their being replaced by fibrous tissue or in other words, to interstitial inflammation so-called following upon so-called parenchymatous inflammation.

We find at the present day the inflammatory process is narrowed down to the result of a localized invasion of pathogenic microorganisms.
We may well recognize pathological processes in the organism as the result of two main processes, the abnormal metabolic processes, alone, and widespread in character, and on the other hand as the result of micro-organisms - but no hard and fast line can be drawn between the two for many diseases, of the former class are due to proceeding micro-organismal disease, and many of the latter are incompatible in the healthy metabolism, as Professor Cheyne has truly said -

"Health, living tissue in the best condition!"

With this knowledge our treatment of disease becomes more circumscribed and rational.

In our one physiological measure we now seek to prevent the anaemic ischaemic condition referred to above by adherence to the principles of hygiene - diet (Streets), and by sanitary precautions, seek to prevent the influence into the organism of the pathogenic micro-organisms.

And in the treatment of disease itself when established, if it be acute, we bring our resources to bear upon the maintenance of the healthy metabolism in the struggle...
against the invading microorganism, in addition to what we can mere efficaciously by antiseptics, the microorganisms that have invaded the organism. If the disease be chronic then we deal chiefly in dealing with the tissues, in restoring them preserved metabolism to the healthy standard. Thus we see in the present state of our knowledge of diseases to be largely our success in treatment depends upon the supporting of cellular metabolism, as a metaplastic disease of great importance; also during the acute stage of obscure, and when it has become chronic.

Strange indeed that such a thousand things should keep to time so long. We lay much stress on the continuous unremitting action of the heart and we say no wonder that in the wear and tear of life its energy becomes exhausted, that functional derangement supervene, passing on to ultimate breakdown. But surely it is not only the heart that rests not, the muscles and indeed the whole vascular system share alike with the heart in
Unremitting effort may save the whole cellular economy if forever carrying on the vital metabolic process of systematic taking up and giving off and in fraternal reciprocity is conserving strength a force to the heart in the dark hours of the night.

Weil has Mr. Henry Sutton defined rest as "Not doing nothing but not harming anything".

While by a homely God we are enabled for a brief season to lay aside the functional activity of our cellular system while they cease to do so long as they do not cease to be they are forever aware in the details of their living metabolism. One would almost think that rest is an active process like the diastole of the heart so that in state of great systemic debility and exhaustion rest and sleep cannot be obtained; and while we are wont to think when sleep as an anaesthetic condition of the cerebral cells that very condition is a fruitful source of wisomnia. It is wonder then that not only the heart but bony muscles never long live bruised train breakdown too in the Battle of Life
for they, too, though we cannot feel them, are in our nervous system and are still ever throtting with the life of cellular metabolism.

Mere denials then, and mere importunity as a factor in the etiology of cancer disease (as has been aptly pointed out years ago by Irene in her Harvard Orations on Seattle) is not sufficient. Which we commonly term debility. Dr. Michael White in his work on Physiology tells us that every beat of the heart is a pulse crossed in the fulfillment of life and that every beat missed makes it to much the harder for the ensuing one to accomplish. So to every drop a man's cells remain in a condition of defective metabolism. It is so much the more difficult for them to affect a return to the healthy standard, for depressin begins depression. The various functions of the system are thrown out of gear and the functionwise powers of the body being so dependent on one another. There are started a series of morbid conditions which as such is but going further and further increase the atomic condition of the organism and from what are at first merely functional, deranged processes
We eventually reach from just such a simple origin organic degeneration.

Friedl's (Hans von Braudin)

"Debility, if once set up, remains and lasts for a day and gives away need not be regarded with much solicitude either by the surgeon or medical practitioners, but unfortunately this is not the case for debility cannot exist for any duration of time without the most serious inconvenience, or without in many cases leading to the most important consequences. As far as we can judge a large proportion of the illnesses of mankind have their origin and their immediate source in debility and if in the first instance weakness is worked off by care and good treatment the disease is prevented and if subsequently, by the natural powers of the body comes to an end."

Let us now just look at some of the phases of the debilitated state as we see it for instance in the capillary circulation, upon a healthy or morbid condition of which so much physiology or pathology rests. From the left side of the
Heart, the blood is propelled by the muscular
left ventricle into the large elastic aorta
where it becomes shut off from the heart
and is carried on from the aorta through
the larger and smaller arteries, where it is
equalized and diffused by virtue of the
elastic and muscular coats of the arterial
system until at last we find it flowing
through the capillaries at a constant equal
flow—these latter can exercise no direct
influence on the movements of their contents,
yet that constant interchange between the
blood and the tissue does in some measure
facilitate the movement of the blood through
the capillary system and thus constitutes
one of the important forces of the circulation (Keith).

Nor can we recognize the capillary circulation
as complete without taking into account
its continuation into the veins which is
accomplished even over the great resistance
met with in the capillaries, by the un-
consumed action of the heart aided by such
subsidiary forces as muscular pressure
and respiratory movements.

It has been often said—'a man is as old as his arteries.'
might it not be said life is as old as his capillaries. The important is the capillary circulation for it is in this minuscule insignificant portion of the circulatory system (overlooked by Harvey) that the blood in beautiful even flow comes in contact with the tissues in the unceasing life-giving interchange of cellular nutrition. While the larger portions of the circulatory system prepare for the journey of the blood, these minute vessels, themselves possess an essential function of actually dealing out the vital fluids to the tissues forming the field where cellular metabolism actually takes place. In debility, how great is this sphere of nutrition affected - alone capillaries circulating around blood amongst atrophie cells. Just as in health the cells and the capillaries mutually maintain the balance of nutrition so in debility, when this balance is upset they mutually hinder the process. The cells in their alone condition take up peevishly, elaborate peevishly, eliminate peevishly and in connection
In the latter, the metabolic act of metabolism, we must remember this is no passive but an active process (like the diastole of the heart). In their healthy metabolism, the cells exercise an important excretory function in the economy. As Halliburton in his Gourmetian Leabirs (1893) writes: "The reaction of living protoplasm as a whole is alkaline, but there are various acid products formed as the result of protoplasmic activity such as carbonic acid, lactic acid, uric acid, and in one very marked case that of the gastric cells, hydrochloric acid. It appears to me more than probable that during the reaction of protoplasm or of parts of the protoplasm is a changing one; the reaction may be as unstable a condition of equilibrium as the other factors of cell life are. We know that when the circulatory cease and the cells can no longer build themselves up from new material but are still sufficiently living to continue their regressive or metabolic changes their tissue become acid from the accumulation of such substances as lactic acid or from the formation of
acid phosphatic. This tendency to become acid is being constantly corrected by
anabolic or assimilative changes during
healthy cells life etc.
Thus, in a state of debility, the blood becomes
improperly separated and loaded with the
products of unbalanced metabolism. They
say neuralgia is the forerunner of the neuro
for healthy blood but is it not also the
reason of the blood for healthy nerve
metabolism. Is it wonder indeed that
under such a state of perverted nutrition
such as we have been considering these
arise, a mutiny in the nerves, nerve
cells store in their neuralgia epiphysiological
cells of the respiratory organs or stamina
these of the heart in angina pectoris;
may more is it wonder that these
fundamental derangements which themselves
emerge so much pathology press on into
the sterner pathologic processes of
organic devastation. Viewing this atomic
condition of mutiny we can surely well
understand the atomic ischemic origin
of the so-called interstitial inflammation.
that is now held by pathologists.

The case in a state of activity may have its life-history cut short by the destructive agency of certain micro-organisms. This is well illustrated in the case of pulmonary consumption—

in both of a tubercular stage of consumption is perhaps somewhat retarded in these days of anti-philosophic enlightenment—

nevertheless, from a practical clinical standpoint I am convinced it is apparent and all important. More and more does clinical supervision teach one that the acute process of phthisis does not burst out into flame all at once—far from it. Indeed in many cases occurring even in those with the strongest hereditary predisposition we have evidence that for some time previous there has been a gross disregard of the ordinary laws of hygiene. Suppose our patient died of overwork, worry, anxiety, interference and so forth, leading to a state of lowered vitality (hypotrophy, scrofula) manifested by such symptoms as languor, constipation, loss of appetite, and above all anaemia.
(In this letter I consider a few remarks on the diagnosis of acute phthisis from acute pneumonia being so frequent, present in the former).

Again and again one meets with such cases, here is no cough or no pyrexia; physical examination may reveal a hoarse respiration and a prolonged expiration. A harsh, weak respiratory sound. It may be a fine crepitation at the end of inspiration. These cases being placed under favourable hygienic conditions, plenty of fresh air and exercise and good food but especially open air exercises may be readily restored to health. What must believe the trouble is present at this stage it is all the more encouraging for it shows what a dormant creature it is and how readily it may be overcome by the care of its maintenance restored before it is damaged by the acute inflammatory reaction.

Sir Henry Sutton wrote, "Further observation has revealed finer morbid changes leading to the tuberculous inflammatory destruction of lung and liver. These finer morbid changes,
Leading to tubercular inflammation, destruction and that those prior mucus changes of
rubrum in general and in special
changes are the essential conditions pro-
ducing phthisis. There is a growing im-
pression that the lung destruction is the
smallest effect. In the early period of
phthisis, there are various special disorders
and various general disturbances thrown
upon the physiology, functions.

We have to look upon phthisis as being made
up of many physiological disturbances, and
it can only be cured by bringing those
disturbed physiological changes into order
again and in this way hope in the cure
of phthisis may be entertained.”

I am of opinion that by persevering
effort to improve the hygienic conditions
of the community, not only amongst the
poor but the rich also, by witnessing
upon the daily the extreme need and
importance of regular exercise and pure
fresh air, we will be doing more to pre-
vent consumption than by our most
elaborate systems of disinfection.
Hankins (Med. Mag. Oct 1893) says,

"We cannot hope to destroy the ectothrophic sources of infection since they are too widely distributed, nor can we destroy the affected mononuclei since such destruction must always be incomplete and unavailing even if free from other objections. We must rely chiefly upon the removal of the specific predisposition to counteract the causes responsible for such predisposition and at the same time destroy as far as possible all ectothrophic sources of infection."

Then may follow the true tuberculous stage of consumption with pyrexia and other manifestations of active inflammation, metabolism in the lung. It is a true inflammation, a vaso increased activity of cellular metabolism, but it represents depression for all that— it is the struggle for life against the microbes of the destructive bacillus. When as his reader Balfour in Briton's dos, "In a case of tuberculosis consumption it is generally assumed that a destitute..."
Inflammation of the lung is the chief cause leading to the patient's death. It is not the inflammation which is to blame, but the vessel which caused it. How long it would take for the non-resisting lung to become wholly occupied by this particular condition is impossible to say, but it is safe to assert that the inflammation of the lung prolongs the infected man's life and that his prospects of improvement and recovery depend almost wholly upon it. The object of inflammation is protective, and its end is shown by the freeing of the body of noxious organisms which lead to death, or upon what may well be described the anathema lavished upon what is in its primary purpose a curative process. I have sometimes wondered if the physicians prescribing most exclusively the balsamic, origin of consumption, mesquite, mistletoe and other contrary remedies in the treatment of the disease—claiming observation shows how right they are in so doing only I suppose the benefit comes not so much from the direct treatment of the inflammation,
process but the relief given to the circulation in the diseased area and the resulting improvement in the cellular metabolism, comparable perhaps to the application of a hot sponge to the precordium in the case of a failing heart.

In this stage we must look more to the

vivants than to the wall; not so much now by coming through these have their place

(fresh air and exercise amongst the best),

but antiseptics must we endeavour
to combat the disease stage. No overpowering

is the vivant that it is helpless (and this

is the so-callederosis, pyophthisis) to attempt
to strengthen the cells sufficiently to stop
the bacilli by their unaided efforts,

though we do believe healthy living tissue
is the best antiseptic. Therefore while we
do not neglect to do all we can to support
the vivant, we eagerly seek the destruction
of the irritant. Here comes in that great
achievement in the annals of medicine—
The Antiseptic Treatment of Phthisis—
well explained and emphasized by
Dr. Burney in his little book on the subject.
The constant inhalation of creosote as recommended by him I can testify from my own observations in practice to be attended with most satisfactory results. This method of inhalation has been disregarded as inadequate to destroy the activity of the bacillus, but granting this, we must ever remember that in phthisis specifically in the stages of softening and cavitation we have present a mixed infection. This is the great danger of a tuberculosis process as met by the surgeon; for example, a swelling ankle joint suppurates, a burn then there ensues, entrance of pus, mixed infection, speedy disorganization of the joint, hectic fever and death. Hence the surgeon anticipates nature operating under the most strict antiseptic precautions with a good result. Often we do no more by these antiseptic inhalations than to obviate this mixed infection. We do much twofold, arresting indirectly, the activity of the bacillus and Constitutional disturbance.

Dr. Douglas Poulle says, "Although having but little direct action upon bacillary activity, these
Substances (Class 3) have an indirect germicidal function in that they diminish suppuration in the walls of cavities and tubercular centres which clotted in the first instance by tuberculosi tends to be perforated through the action of pyogenic microorganisms and thus to render adjacent tissues more accessible to fresh tubercular attacks.

If by these means we are successful in arresting the tubercular process; then in the lung there is left an area in which fibrous tissue less elaborate and with smaller tubular elements takes the place of the cellular, and it has embedded in it the spores of the tubercle bacillus.

How important then to endeavour by all means in our power to place the patient in such favourable circumstances as to health that his general nutrition and especially that of the lungs may be main...

ained in as high a state of vitality as possible in order to prevent further infection above all thing, plant fresh air and exercise
Thus may the cell of cellularity become the
fines of the minute; but it may escape
this danger and run its course to a
premature end in another way. It may
become destroyed by the products of its own
prevented chemistry, manifested by certain
functional disturbances, of which Sittu's
is a good illustration, it will be described by
H. H. H. of London in his work
"Physiology as a Factor in Disease."

A time comes, however, when these functional
arrangements tend to pass into organic
degeneration, so that after 40 years of age
letinosis with its functional disturbances
becomes represented by grey and its
organic degenerations, arthritis socalled,
or as Quill and Sutton have described them,
arterio-occlusive sclerosis. Jonathan Hutchinson
says, "When a little white lozenge is seen in
the ear the worst type can read it lesson;
and the veriest sceptic dare not refuse
its revelation" and adds, "it tells of un-
bound feeling, of the danger of attack of
arthritis as well as the probability of
undercut affection of the smaller joints.
of thickening of the arteries and of the
metabolism (of the individual kept alive) of the
liquefying of the morbid changes being trans-
mited."

This quick recentl9 has been regarded as
a purely chemical disease but there is now
considerable evidence to shew it is also tropotol
German Lee boys, "The acid is not the result
of incomplete oxidation of the proteins - just is
caused by xanthine in their progeny amongst
others by nucleic a nucleo-aluminus of the
white globules, which from uric acid - usu-
Marques not only a chemical lesion but both
chemical and trophic. Of these four gives
rise to bright oredone it is by its present
the formation of arteries - sclerosis which then
attaches either the kidney or the heart causing
sclerosis of these organs."

Dr. Halliburton (Emulsan, 1873) says,
"Among the products of decomposition of
nucleic are certain nitrogenous bases -
one pair is adenie and nepoctanthine; the
other xanthine and guanine - Adenie has
made formula C_{5}H_{7}N_{5} - on treating with
sulfuric acid NH is replaced by O and
Hypoxanthine is thus formed:

\[ C_5H_4N_4O + \text{H}_2\text{O} = C_5H_4N_4O_3 + \text{NH}_3 \]

Adenine water hypoxanthine ammonia.

Both substances contain a radicle, \( C_5H_4N_4 \). Which radical form adenyl; adenine is its simple hypoxanthine is its oxide. The following equation shows a similar relationship between guanine and xanthine.

\[ C_5H_4N_4ONH + \text{H}_2\text{O} = C_5H_4N_4O_3 + \text{NH}_3 \]

Guanine water xanthine ammonia.

Now on comparing the formula of xanthine and hypoxanthine with uric acid we have

\[ C_5H_4N_4O = \text{xanthine} \]
\[ C_5H_4N_4O_3 = \text{hypoxanthine} \]
\[ C_5H_4N_4O_3 = \text{uric acid} \]

In other words, here is a series of three substances each differing from the preceding by an atom of oxygen.

Leaving aside other possible ways in which uric acid is undoubtedly formed in the organism, we have here a possible way in which by a process of oxidation uric acid is formed from xanthine and hypoxanthine and thus ultimately from the musclen and the cells.”

No clinical testimony wanting to show the importance of played by celibity in leading to an
Dr. Haig (PMJ, Aug. 1893) wrote:

"In all conditions of debauchery and marasmus there is a free in the formation of urea and in the acidity of the urine. Albumin which in health excretes 250 cc of urine and acid equivalent to 2 cc nitric acid in the 24 hours unless it suffer from marasmus secretes only 100 cc of urine and acid equivalent to 15 cc of nitric acid. The acidity of the blood will be correspondingly increased with the efferent that becomes a better solvent of uric acid. I have shown that all the impurities against the tissues of the body contain a considerable portion of uric acid and as the solvent power of the blood increase some of this is taken up and passed through the blood into the urine and hence the excessive secretion."

Dr. Andrew Smith (Boston Med. & Surg. J., Aug. 1893) wrote: "The primary cause that produces instant is those agents that disturb the metabolism of the cells of the body causing them to run down outside of their line of normal development in their life manifestation and thereby producing an excess or diminution of products of normal..."
The late Dr. Henry Sutton pointed out that in the syphilis there is a weakness in the venous circulation, and that such patients suffer much from cold hands and feet associated with a defective nervous function.

Years ago, Fine, in his "Harvian Orations" said, "In your debility, has an important bearing; it is almost impossible to cure the disease during its existence, while it runs a chronic course, and the surgeon has the double duty of relieving the strength and attacking the disease."

Dr. Frank (on thymus and nervous diseases) pointing out the relation between flat and struma wrote, "Flat and struma are alike to be both affection involving chiefly the albuminous element of the body. In both diseases, the albuminous principles, though to a certain extent organized, are not raised to the healthy standard as to be fitted for appropriation to the living body. In some instances, also, independently in struma the unformed albuminous principles perhaps possess a low independent vitality. Instead therefore of becoming component parts of the living body, they either form accessory growths,
are deposited as extraneous bodies, and this by interfering with organic functions.

In relation to the diseases we call gonorrhea and syphilis. So far in recent times gonorrhea and syphilis may be supposed to resemble each other in their character and origin. Gonorrhea and syphilis in different instances, coincide not merely in every possible degree, but in every possible state of mixture.

However, the disease is distinctive in its influence on the organism than the most virulent microbe is that widespread ulceration of cellular tissue with substitution of fibrous tissue in its place, which follows in the wake of these venereal chemical processes of the debilitated organism. These changes now recognized under the term 'arterio-sclerosis,' constitute the well known 'arterio-capillary phase,'

With the kidney, degeneration was not in all cases the primary disease and the other organic degeneration associated with the renal condition does not bear attributed moving to the kidney. In some cases they observed the degenerative process began notably
in the brain giving rise to symptoms of
headache, dizziness, weakness, sleeplessness;
otherwise it was observed to begin in the lungs
and give rise to increasing shortness of breath,
and dyspnea, progressive wasting, fluid
in the pleurae and ascites, with
failure of digestion in the blood giving
rise to palpable anemia in the uterus giving
rise to fibroid uterus or in the bladder
with symptoms of what is generally recognized
as the atomic bladder.

Dr. Brown, Yeo (Clinical Therapeutics) writes,
"When we come on examining a patient who
may be thought to be in sound health (a
candidate for life assurance for instance)
or who may complain of frequent urination,
a pulse of high tension, altered menses or loss
of appetite, headache, weakness, a tension, some
evidence of ventricular hypertrophy, and an
accentuated tone in the lungs, we shun
estimate adequately the danger to which such
a person is exposed. Should the coronary
arteries become involved there is the probability
of attacks of angina pectoris, and the
Cererebri arteriarum degenerationi. Shered the cererebrae arteriae be specially affected we may encounter symptoms of cererebra degeneration and of cerebra haemorrhage from rupture of atheromatous atherosclerotic encephalesma and asthma are not uncommon accompaniments of the disease. Renal degeneration and wasted kidneys may be a consequence of renal arteriosclerosis.

Are we helpless to prevent the development of these sores morbid changes? By no means! He goes on to point out in detail how by careful attention to a strict and rational regime, hygiene, dietary and medicinal measures, these risks may be kept in abeyance and a distinct improvement of the arterial system may be brought about.

This also seems to point to the wise importance of attention to the sound underlying principles of health taught us by Nature in order to maintain the body in a state of vigour and thereby to avoid the quiescences that are sure to lead to the decay of those whose organs are in a state of debility. Not only so, but...
even when cerebral obsessions have developed
these hypokinetic principles are working all
consideration in our therapeutic efforts.
These such sundry rules of health I con-
ignore since in the thing conviction
which experience has given as to their
most powerful influence in the prevention
and treatment of disease, viz., fresh air,
exercise and bathing. A man once told
me he nothing so useful in helping
him to withstand the worry and de-
structive influences of life as systematic
exercises. I thought it quite a valuable
contribution to therapeutics when a broken-
down old soldier in charge of a gym-
nasium, on asking him how he was,
replied, "Well it is only 'the gym' or keeps
me up."

Dr. B. of Creedmoor (1858) wrote -
"use of exercise begets growth, development,
and power; disease or want of exercise
wasting degeneration, weakness and ni-
many cases extinction.... However
unpalatable and nauseous the idea, disease
appears to be in many instances an evil
of our own creation, and I cannot help thinking that the allotted term of three years and ten might be much more profitably attained by a constant persevering habit of scopial sincerity, and sincerity maintained by systematic exercise."

I am just touching the fringe of a very large subject. The Bygathyronic, or Hygienic Treatment of Disease, which I cannot enter upon with cirrip here as it does touch important questions as The Open Air Treatment of Phthisis, exercise in Kent. Dr. T. E. Earnest, in his book, makes reference to a convincing address by Dr. Edward O. Otis, Boston, on Pulmonary Tuberculosis with especial reference to its Bygathyronic and Hygienic and Climatic Treatment, published in the Boston Medical and Surgical Journal for October 1893, in which one's highest conception of the subject are embodied.