

Thesis on
"Old Age, its Pathology
and Treatment -"

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As Medical Officer of Health to the Ashbourne Rural District Council I have been much struck, when examining the death certificates by the frequency of such terms as Old Age, Senility, Decay of Nature &c given as the cause of death, and this fact along with the large number of aged people that I come across daily in the course of my work has lead me to look more fully into the subject than I had previously done - it is a common saying among the laity of the district that "if it was not for the public-houses no-body would die of anything but old age" - If we take the five years 1895-1899 inclusive we find that in an average population of 10,791 we get 60 deaths (29 male, 31 females) registered as due to Old Age alone, equal to an annual rate of 1.112 per thousand living, as compared with 0.931 the average rate for England & Wales during the same period! - If we add to these the deaths where Old Age is given as one cause of death & some secondary disease or symptom is added we find the number increased to 262 (129 males, 133 females) equal to an annual rate of 4.855 per thousand living - Of these

1 Life Tables of the Registrar-General -

262 deaths 7 (2 males, 5 females) died before the age of 70 yrs, their average age being 66.8 years & their actual ages being 62 (Cause of death "Valvular Heart Disease, Senile Decay"), 69, 69, 67, 66, 68, 67 - Three of them were due to "Old Age" simply, all being females of ages 69, 69, 67. It would therefore appear that the great majority of deaths from Old Age occur after the age of 70 and for this reason in the statistics I give I have only taken deaths among persons of 70 years & upwards - Strictly however it is quite impossible to fix a certain age as being that of Senility as this condition depends on the personal equation and not on any actual number of years - as Cazalis says, with some truth as I hope to prove not absolute truth, "One is of the age of his arteries".

In studying Old Age the first thing one notices is the paucity of literature on the subject, & especially English literature - Some good work, with careful observations, has been done, in France by such distinguished physicians as Pinel, Landré-Beauvais, Rostan, Cruveilhier, Hourman & Dechambre, Durand, Fardel, Orus, Beau, Guilette & Charcot, chiefly working at the Salpêtrière Hospital, Paris, and Boy-Teissier at Marseilles; also in Germany by Canstatt, Geist & Mettenheimer; but in Britain few beyond Rogee, Symonds, Day, MacLachlan, Balfour & Humphry would

appear to have paid any especial attention to the matter. These men too, with the exception of Boy-Teissier, have studied the pathology of old age rather than what I consider true Old Age, which is itself a physiological condition. Apart from the writings of the above mentioned men the world's literature has been more or less on the lines taken by the old philosophers rather than on those of Modern Science. Considering the large population of aged persons constantly in the workhouses & almshouses of this country why are such great opportunities for observation continually being lost by us? The reason is not far to seek:— Old Age is not a disease but a grade of life & all we can hope from medical treatment is to add to the comfort of the closing years of life & to make death itself the purely physiological change that Nature ordains— now-a-days we do not expect to find any ~~good~~ ^{our} ~~energies~~ Elixir Vitæ as the ancients did and therefore we prefer to expend our energies on the study & treatment of disease, whether it be in children or in adults.

I have said that Old Age is not a disease but a physiological condition— From the early times life has been divided into stages or climacterics, the number and duration of these varying with the philosopher describing them, but for practical purposes it is only necessary

to recognize three, Growth, Maturity & Senility, and these it is impossible to divide absolutely, nay, here we change from Maturity to Senility, for each stage glides imperceptibly into the following one, from the embryonic Blastosphere to fully developed Manhood & on through Senility to the physiological death from old Age.

That death is a necessary outcome of life is evident; for all living matter must maintain itself by taking & assimilating nutriment from outside (thus differing from inorganic matter), and it also has the power of producing directly or indirectly other living matter of its own nature, so that if death did not take place naturally, life must at last be starved out of the organism from famine — further if death did not put an end to life the struggle for existence would be constant, & life would only be granted to the organism with the greatest brute strength; this organism would constantly have the unpleasant knowledge that the struggle must go on everlastingly unless life be interrupted by some other organism of greater strength, and at the same time would feel its functioning powers getting weaker as ^{age} advanced.

We must still confess however to not knowing what Life really is; we know that it consists in "the continuous adjustment of internal relations to external relations" but this tells us rather the conditions necessary for life rather

¹ Herbert Spencer - The Principles of Biology - Vol. I p. 80.

than what Life is and carries us no further than the ancient idea of Vital Force.

Senescence then is the period of life during which the organism passes from its fully mature state to its physiological death, this death being both necessary & desirable; during this stage certain changes take place resulting in loss of functioning power in the various component cells & laying the organism open to special dangers from both external & internal influences, and it is these influences that the physician is called on to guard against and counter-act as far as possible so that death may come neither before its time nor in any irregular manner.

To fully appreciate the organic & functional changes of Old Age it is necessary first to glance at the subject from a biological point of view, looking on Man as an organic compound consisting of innumerable inferior organisms, each with its own structure & function - In addition to the fact that living matter is essentially unstable Sabatier points out that it also has a power of attraction (*puissance d'attraction*) by which it can reproduce its kind, a particle of itself however being necessarily detached & this particle affecting the surrounding medium in such a way (by its power of attraction) that a new living being is produced similar to the original - but living matter is also distinguished by

¹ Sabatier. *Essai sur la Vie et la Mort* -

its instability, that is, there are constant chemical changes going on in it leading to loss from wear & tear, & this loss must be repaired from outside, so we have the assimilating powers added. This gives us the simplest organic cell, but this cell multiplies by its power of attraction & we get several cells each of which may gradually assume special functions of its own - We find however that as the functions become more specialised & higher the power of resistance to external influences becomes weaker, & the power of reproduction of its kind is lost. The assimilative power is diminished along with the others, but the cell has a store of reserve energy to fall back on, & while this lasts life is continued ^{but} the cell is now in a state of senescence - finally this reserve gives out & the cell passes from a condition of life to one of death, its place & functions being assumed by another cell developed in the same way from the more primitive cell.

Thus we get man developed from one embryonic cell, which by division gives rise to many simple cells with intense powers of instability, attraction & resistance, but these cells become specialised in course of development, forming the noble elements of physiologists, & so gradually lose their above powers - The power of reproduction being lost, & these cells becoming worn out, it follows that the whole compound organism must die.

7.

Theories as to Cause of Senility -

Many theories have been put forward to explain the cause of Old Age, among which we may mention: -

i. Réveillé-Parise¹ first proposed that Senility depended on the changes which occur in the respiratory apparatus; these changes diminish the functioning powers of the lungs, hence the blood is not oxygenated as it should be & the various tissues fail to receive an adequate supply of nourishment & undergo degeneration in consequence. But this theory may rightly be objected to on the grounds that although the changes in the Respiratory System are usually present in advanced age, they are not constantly so & if ^{present,} so they are pathological.

ii. Hamelin & Montpellier carried the above theory a stage further back, pointing out that the respiratory changes were due to ossification of the costal cartilages & union of the various parts of the Sternum, these changes interfering with the free action of the lungs; but here again these changes in the cartilages are not constant & indeed Sir George Humphry² "invariably found the costal cartilages soft" in old persons on whom he performed post-mortem examinations.

iii. Roget³ referred the change to the affection of the nervous system saying that the nervous power of the heart is less, hence

1 Réveillé-Parise - *Traité de la Vieillesse* - 1853.

2 Humphry - "Old Age" - p. 22.

3 Roget. Article on "Age", *Cyclopaedia of Practical Medicine* - p. 42.

the circulation is feebler & condensation of tissue is the result. Symonds¹, criticising this view, suggests that it is the vitiated condition of the blood which causes the weakened action of the heart, the vitiated condition of the blood depending on the respiratory changes, the change in the chyle & the altered tissue changes throughout the body; or if the change be nervous then it is due to changes in the nervous tissue itself - but these numerous changes must be themselves explained & no explanation is offered for them unless they also depend on the vitiated blood, which brings us back in a circle to where we started from.

iv. One of the more recent theories & that which is probably most extensively accepted at the present time is that Senility depends on sclerosis of the various organs, which is almost always (here again we cannot say absolutely always) present in the aged. It is generally accepted that arteritis frequently causes sclerosis by cutting off the blood supply, & the two being so frequently found combined in the aged has led to the conclusion that Senility depends on this arterio-sclerosis - But surely this again is a case of the cause being mistaken for the effect, is it not much more likely that the arteritis is the result of Senility and not Senility the result of arteritis. Martin² has elaborated

¹ Symonds, Article on "Age", Cyclopaedia of Anatomy & Surgery. p. 79.
² H. Martin - Revue de Medicine - 1881.

The theory stating that obliterative endarteritis attacks the smallest blood vessels, thus cutting off the blood supply to the organs & causing atrophy & sclerosis of them - the cause of the endarteritis he states to be the vitiated condition of the blood, but he fails to explain the nature of this vitiation - there is no doubt that endarteritis may be caused by a toxic condition of the blood, but at present this explanation of the occurrence of senile changes is incomplete.

V. Althaus¹ considered that the essential change occurred in the central neuron, involution occurring as a result of arterio-sclerosis - he considered the changes similar to those described by Hodge² as a result of poisoning by phosphorus lead arsenic - the body of the nerve cell was found to swell, the chromophile substance underwent granular disintegration, the spindles losing their striped appearance & staining power, & at the same time the neighbouring neuroglia was found to proliferate - it was found that all these changes might be reversed from, provided the nucleus was undamaged - In old age Althaus found that the same changes took place but that they went further, the nucleus being destroyed & the neuron being replaced by neuroglia - The fault of this theory is that the changes are ascribed to arterio-sclerosis but the origin of the arterial change is not explained.

1 Althaus - "Old Age & Rejuvenescence" - *Lancet*, Jan^y 21, 1899.

2 Hodge - "Changes in Ganglion Cells etc", *Journal of Physiology*, Aug: 1894

vi. Boy-Teissier¹ bases his theory on biological grounds. I look at the subject as I have done for some time. I considered the theory my own, but while writing this thesis I have come across Dr. Boy-Teissier's most excellent article, & it was with mingled feelings of pleasure & disappointment that I read it, pleasure at the general excellence of the paper & disappointment at finding my views already published by some one else. We have seen above that as life progresses from the elasto-sphere onwards the cells gradually become differentiated into groups with special functions, but that all these varying parenchymatous elements really spring from the same origin. The connective tissue cells are the simplest in the mature person & most resemble the original elasto-dermic elements, retaining their intense powers of attraction, resistance & instability - Sabatier² speaks of the connective tissue as post-embryonic elasto-dermis & insists on its function being the same. As a cell joins some special function whether secretory, motor, nervous or otherwise it gradually loses its other functions & being unable to repair itself or reproduce its kind it dies & its place is taken by another cell which has passed through the same stages of development as itself. At times comes however sooner or later when the supply of connective tissue cells fails, or

¹ Boy-Teissier - "Old Age" - Twentieth Century Practice of Medicine Vol xii. p. 441.

² Sabatier. Essai sur la Vie et la Mort.

they are incapable of reaching the highly specialised form required of them; the parenchymatous cells failing the connective tissue cells take their place, causing a form of Senescis & concomitant with this change the stage of Senescence set in -

The effect of this deficiency of parenchyma is to reduce the functional activity of the organ or organs concerned & as soon as this failure of function appears the stage of Senility is reached - Similar changes are going on throughout all the organs & tissues of the body but, other things being equal, the relation between the functions of the different organs is maintained.

Anatomy & Physiology of Old Age.

The characteristic anatomical feature of Old Age is Atrophy, of the essential elements & to this may be added a physiological Senescis which Boy-Teissier distinguishes from pathological sclerosis by the name 'Perosis' - We have seen above that as a cell gains specialised functions its more natural functions diminish in power, & it is further found that it is the power of assimilation that first fails - failure of assimilation means lack of nourishment and so still more rapid failure of all the functions with shrinking & diminution in size of the cell, that is Simple Atrophy - This condition

1 Boy-Teissier. Ibid p. 460

is especially well seen in the muscular cells, these being found diminished in size but practically unaltered in structure.

We have also seen that the connective tissue cells lose their power of becoming so highly specialised & they only get on for as forming fibrous tissue instead of glandular or other special cells; further fibrous tissue has a tendency to contract so that it is evident that from a combination of these changes the whole senile organs & tissues diminish in size. Some of the cells pass beyond the stage of simple atrophy, the contents becoming granular, & on rupture of the cell envelope, being discharged & gradually absorbed.

The more specialised the function of the cell the more rapidly do the assimilative & resistant powers diminish, & so we find that as age advances, the first cells to show the effect of age are usually the highly specialised cells of the brain, while the less highly developed cells of the digestive & circulatory systems, retain their full powers to a much later period.

With the loss in number & size of the noble elements it is evident that the functions of the whole organ or organs affected must diminish in power & so in the aged we find all the natural functions diminished & retarded. As however the organs are affected *pari passu* a due relation is kept up between the various functions & life continues

1 Otto Weber - Handbuch der allgemeinen und spec: Chirurgie 1891 p. 161..

easily & comfortably unless this due relation be ruptured by disease. As illustrating the relation kept up between the changes in the various functions of the body we may consider the joints - here as age advances we get loss of mobility, but this is seen to be a safeguard really when we consider that there is also weakening of the muscles which control the joint, & keep the two bones in position.

These senile changes however may be variously modified by disease, becoming then pathological; they themselves are also found to modify the course of ordinary disease, & may be the direct cause of disease - for with the loss of power of assimilation we get imperfect removal of waste products with all the consequent liabilities to auto-intoxication; and further, senile changes in one organ, say the Kidney, may produce general effects on the whole ^{organism} system & actual disease in other organs.

As soon as the assimilative powers have fallen so low that repair cannot fully make up for wear & tear Senescence is fully established, & becomes more accentuated from day to day, till gradually the functions are lost altogether, & the organism passes into a state of death. I cannot do better than quote Boy. Teissier's description of death from Old Age: - "The greatly diminished functions permit of very limited movements; the digestive organs have

1 Boy. Teissier - Ibid: p. 494.

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almost no work to perform, and the appetite seems to have disappeared; hæmaturia, which has become almost useless, has no longer need of a more rapid or prolonged contact of the blood with oxygen; the respiratory movements are therefore reduced in number and in intensity; their retarded rhythm conveys no idea of respiratory distress or of struggle for air; the examination of the heart shows regular pulsations, diminished as regards their intensity, and also, though less evidently, as regards their number; we feel actually that the heart has itself also nearly exhausted its coefficient of contractile power & that it still contracts, no longer in order to fulfil a rôle which is henceforth useless without effect, but because simply there are still remaining in it some traces of its functional power. And all this takes place without effort, without noise, without persistence, because there is neither struggle nor reaction." Rare indeed must be such cases of death from true general old age, much more frequent is it to find the changes more pronounced in one organ than another, and with resulting special symptoms, and we find people dying rather from old age of heart, kidney, brain &c, if not from some concurrent disease.

Unnatural Old Age.

Old Age may be unnatural either from being induced prematurely or by being complicated by pathological conditions; rare indeed is it to find uncomplicated Old Age, in this country at all events, whatever it may be among less civilised races - Civilisation in itself is calculated to prolong the average length of life as sympathy & fellow-feeling are developed, & the young care for & cherish the old, instead of leaving them to their own resources as in the lower animal world - but in this Twentieth Century competition is so keen and general methods of living so rapid, that Senescence is hastened & people are worn out bodily & mentally before they reach a "ripe old age" -

The natural period of life has been variously estimated: -
Raper Baem stated that the natural length of life was eight times the period taken to attain perfect maturity; while Flourens' says it should be five times the period taken to reach maturity which he reckoned at 20 years, at which age he considered union of the epiphyses complete; but we now know that some epiphyses (e.g. Clavicle & Vertebrae) do not unite until the person is 25 to 30 years of age.² Buffon suggested that length of life depended on length of gestation, but though this is true for some animals e.g. rabbit, cat & dog, it is not true for others e.g. horse. Beneke³ gives the ~~average~~ normal human life as 90-100 years -

1 Flourens. De la Longévité Humaine - 1860.
2 Gray's Anatomy - Eleventh Edition - pp. 196, 117.
3 Beneke - Die Altersdisposition - S. 26.

As a rule the change begins to be appreciable in man between 50-55 years of age & from that time onwards it is usual to find symptoms of failing energy becoming more marked. About this age it is frequently found that a person tends to some degree of corpulence, due to imperfect oxidation of the blood resulting in fatty degeneration, but later this generally disappears, the fat being absorbed, & giving the thin appearance of typical old age. About now too the joints begin to get stiffer and the muscular energy, fails & by the time 60 is reached, recovery power after fatigue is found to be slow & deficient - it is this reduction of neuro-muscular power that gives the surest indication of approaching senility, the loss being due in the first place to failure of the nerve cells rather than any change in the muscle tissue.

Sir Henry Hallford¹ in 1813 described what he calls "Chinactonic Disease", stating that it was a special disease & not simply decay, as men were often found to rally from it. He describes it as "a falling away of the flesh in the decline of life without any obvious source of exhaustion, accompanied with a quicker pulse than natural, and an extraordinary alteration in the expression of countenance" - The disease comes on gradually & no special complaint is made but the patient becomes thinner & is more easily fatigued than previously; the

¹ Hallford:- Transactions of the Coll. of Physicians of London - Vol IV, 1813. p. 316

appetite is impaired, the patient is restless at night & not refreshed by what sleep he gets, the face is emaciated or may be bloated, the tongue white. There is often pain in the chest & head & the legs tend to swell. The urine is passed in full quantity but the bowels are sluggish - often fiddiness is complained of and "rheumatic" pains in the course of the nerves. The digestive functions fail & general emaciation follows, but is often accompanied by oedema & anasarca; the mind grows torpid & indifferent to outer things & the patient usually sinks - he may however gradually recover but the energies of the frame are never the same again, nor does the countenance recover its old expression - It is usual to have other complications added. The disease usually shows itself between the ages of 50 & 60 years.

Dr. Henry Kennedy of Dublin described the same condition in 1844, occurring in younger people, & he found it "by no means unrequent between 20 & 30," but found that the pulse rate was not increased from first to last, the urine was diminished, & pain in the head was a constant symptom and periodic in character.

The disease was ascribed to anxiety or mental trouble most usually, but might also follow a chill, accident, act of intemperance or marriage late in life - Kennedy found it to last from 4 months to 2 years, usually about 9 months -

1 Kennedy: - Dublin Journal of Medical Science - Vol. 25, 1844.

These descriptions however read very much like those of Old Age without special localising symptoms, & the only treatment found of any use was the general treatment to be later described & meted out to all aged persons showing signs of failing energy. Also how often do we find the final "breaking up" of the aged brought on somewhat suddenly as a result of some great mental trouble.

Circumstances hastening the onset of Old Age.

What then are the causes of this premature Senility? In such questions as this the statistics collected by Sir Geo. Humphrey are the most useful we have. In 1880 a "Collective Investigation Committee" was formed by the British Medical Association to enquire into Old Age among other subjects. Sir Geo. Humphrey of Cambridge was entrusted with the subject of Old Age, and sent in reports which were duly published in the "Collective Investigation Records" as a Supplement to the British Medical Journal. He later elaborated the matter & published it in book form, entitled "Old Age" in 1884. Humphrey found that the conditions necessary for longevity were inherent good qualities of endurance, of steady persistent nutritive force, and a good proportion or balance between the several organs - each organ must be sound in itself and its function must be in proportion to the functions

1 Humphrey - "Old Age" p. 11 et seq.

of the other organs. Further there must be freedom from exposure to accidents & causes of disease. It is found that more women than men live to old age; more boys are born than girls, but the ratio is ~~reduced~~ ^{reduced} in the first year of life, & undergoes steady reduction in favour of the females to the end of life. The majority of the cases investigated showed that they came of long-lived families (showing sound family constitution), had enjoyed good health, good appetites & good digestions, they had been moderate or small eaters, usually not taking much flesh meat, temperate in use of alcohol & good sleepers. The converse of each of these points hastens the advent of old age, really by causing disturbance of the nutritive faculties.

Other persons appear to live more rapidly from the first, the functions being phenomenally active often, it may be, combined with deficient stamina, leading to precocity in youth & premature senility & decay - "Such is usually the condition of dwarfs who generally die at an early ^{period} age, bearing all the ordinary marks of extreme old age" -

Premature Senility is also induced by disease & the various diatheses, even if death do not take place early from disease: especially is this the case with persons of the Scrofulous diathesis, when all the vital functions suffer from a lack of energy.

Of diseases acquired during life some like Syphilis, may

1 Rogel. Ibid p. 42.

Cause permanent hindrance to nutrition from the first, Others, like tuberculosis, may do so, but more generally kill by local disease before old age is reached - Others again leave some permanent effect the gravity of which is only fully appreciated some time after the disease is apparently cured: this condition has been sadly too often seen during recent years as a result of influenza.

Chronic poisoning from alcohol, Lead etc, and injudicious diet, either in quantity or quality, are active causes of premature senility, as are also affections of the nervous system, now so common, & without perhaps definite organic lesions, e.g. Hysteria, Epilepsy & Insanity.

Drysdale has called attention to the great preventable mortality among the poor classes from bad living, bad shelter & poor clothing -

Morbid Anatomy & Pathology of Old Age.

We have already seen that the organs of old persons are much less able to resist disease than those of adults, & also that the senile changes may themselves induce disease. It is this latter fact that has largely been overlooked by writers on the subject of Old Age, & hence the descriptions we get are really those of the average old man with the most usual pathological conditions added; it is this fact also that explains the very different views that different writers may hold on

Drysdale - "On the Influence of Suez Circumstances on Longevity" - Brit. Med. Journal, Aug: 20: 1887.

the same subject. As an example of senile change inducing disease we may take the 'Nervio' described above, which, when it affects the vasa vasorum as it so frequently does, may cause an arterio-sclerosis, which in turn diminishes the blood supply to the various organs, so assisting & hastening the senile changes still further; and also by impeding the blood flow calls for increased activity from the heart, with resultant hypertrophy of that organ.

Before studying specialised diseases in the aged, therefore, it will be well to note the most usual conditions, pathological & physiological, as they occur combined.

We have seen that Atrophy goes on in all the organs equally if health is maintained, but this normal condition may be disturbed if one organ be in a pathological condition, e.g. arterio-sclerosis causing hypertrophy of the heart; or the cells in addition to atrophy may undergo one of the special forms of degeneration: -

i. Albuminous or Hyaline Degeneration may affect any of the tissues - The cells enlarge and are seen to contain albuminous granules which may obscure the nuclei; the cell may rupture & its contents be expelled as detritus, ^{which} ~~with~~ gradually becomes absorbed - The tissue affected increases in volume & if transparent becomes opaque.²

ii. Fatty Degeneration is the most frequent form, & may be

¹ Vide supra. Vol. II.

² Coates - Manual of Pathology, 2nd edit. p. 154

fatty from the first or may follow hyaline form. It is usually the result of defective nutrition¹ - It is first seen as small droplets of fat in the cell around the nucleus; these droplets increase in number & size, may fuse to form one drop filling the cell, but usually remain separate, each being surrounded by an albuminous coat.²

iii. Calcareous Degeneration³ may affect any tissue but more especially dead tissue, e.g. tubercle, or any degenerated tissue, & is hence very common among the aged - it consists in a deposit of lime & magnesium salts (chiefly lactate & phosphate of lime), at first having the appearance of fine granules but as the deposit increases forming a continuous petrification. Talamon⁴ has shown that to have calcification we must first have a special modification of the connective tissue, so that calcareous degeneration is not purely passive as sometimes stated, but only secondarily so.

iv. Fibrous Degeneration or Sclerosis is hardly a degeneration in the same sense as the above forms, these affecting the essential cells, while Sclerosis is rather a change in the connective tissue, consisting in an increase of fibrous tissue - it is the commonest condition found in the aged & may occur in all

1 Coates - *Ibid.*: p. 155

2 Coates - *Ibid.*: p. 158.

3 Talamon - "De la Calcification," *Rev. de Médecine et de Chirurg.*, 1887.

4 Coates - *Ibid.*: p. 171.

the tissues and organs - it usually depends on defective nutrition & so follows arteritis,¹ which may itself be due to toxic influences from the blood, it being vitiated from imperfect oxygenation, & from accumulation of waste products² - I have above referred to the physiological condition described by Boy. Teissier as Xerosis,³ where the connective tissue cells form fibrous tissue instead of the more highly specialised cells - it is evident that if this Xerosis affects the vasa vasorum & arterioles we get a thickening of their walls with obstruction to the blood flow & further atrophic & fibrous changes in the tissues supplied. Boy. Teissier considers this Xerosis the only cause of Senile arteritis⁴ & points out that autopsies on the aged may often show sclerosis of arteries (pathological arteritis being excluded) (due of little importance, producing little organic change, & even permitting a regular functioning of the economy - further that generalised arteritis is not found proportional to the age & so is not the cause of senility but a result.

It is probable that each of these various degenerations affects the functions of the various organs in its own particular manner, but the different forms overlap so much that the effects are

- 1 Quill & Sutton: - Med. Chirurg. Transactions. 60, 1872 - Path. Transactions, xxviii, 1877.
- 2 Vide Supra. Fol. 9.
- 3 Vide Supra. Fol. 11.
- 4 Boy. Teissier - Ibid. p. 459.

indistinguishable, at any rate down present methods of clinical investigation.

What then are the conditions most frequently found in persons of advanced years?

"Nothing is more obvious in the condition of the aged as contrasted with the young than the differential ratio between the fluids and the solids, the former being remarkably deficient" both in the tissues and the blood.

Alimentary System. The mucous membrane, such as the glands, gradually atrophies, becoming thin & pale - the gums are white or pinkish in colour, & the epithelium hard from chewing; the gums recede from what teeth may be left. The tongue is lax & flabby, from loss of nervous & muscular power - the salivary glands are little altered, the increase in saliva being only apparent & not real, the dribbling of the saliva so often seen not being due to increase in amount but to the altered form of the mouth, muscular relaxation and debility with diminished excitability & sympathy. The teeth are lost from atrophic changes in the jaw bone & not from disease in the teeth usually - Humphry found the average number of teeth to be 4.2 in men & women between the ages of 80 and 100. The muscular walls of the intestines become wasted & weak leading to dilatation, the mucous membrane is pale

{ Symonds. Ibid. p. 77.
Rugel. Ibid. p. 36

from fatty degeneration of the capillary network, the villi and mucous follicles disappear or diminish in size & number, and the lacteal vessels are much fewer in number.¹ The ^{Atheroma of the vessels of stomach & intestine are also common} Liver diminishes in size and weight, the weight of the female liver (80 yrs upwards) being in males 41.01 oz and in females 34.64 oz as compared with 58.11 oz and 53.61 oz respectively, in men & women from 30 to 40 years of age! The condition of the liver has been specially studied by Boy-Jessier², who describes two main forms, the non-fatty and the fatty - in the former the general appearance is not altered except for the superficial lobules in contact with Glisson's capsule - here we find fibrous bundles shooting into the substance of the lobule & separating & shagling the hepatic cells - in addition to this, larger bundles separate the various lobules; there is also marked sclerosis of the portal spaces, & arteritis of the vessels, with thickening of the veins - the connective tissue lesions do not spread round the vessels but remain localised forming fibrous plaques with distinct borders - the hepatic cells are constantly atrophied: in the female ^{female} second or fatty form of liver we find the fatty lobules arranged in zones round non-fatty lobules & they themselves surrounded by ^{non-}fatty zones - further in each fatty lobule we find a layer of healthy cells round the central vein, then a layer

¹ Boyd. Philosophicæ Transactions, 1861 - p. 261

² Boy-Jessier - Ibid. p. 503.

or two of fatty cells, & then a peripheral layer of healthy cells, thus differing from the ordinary fatty liver, where the fatty cells occur either around the central vein or at the periphery - here again the hepatic cells are atrophied.

The gall-bladder is thickened & often adherent to the liver & may be calcified - it often contains gall-stones though we rarely see 'hepatic-colic' in the aged - The bile is smaller in amount and thicker & contains more cholesterol, a favourable condition for the formation of calculi.² The Pancreas is atrophied and often fatty.

Homoplastic System - The spleen is found to be greatly atrophied & also the lymphatic glands diminishing in size and weight and many of the glands disappearing altogether.³ It is noticeable that the lymphatic & ductless glands, so large in youth during their most active period, show most marked atrophy when general growth ceases - Rolleston⁴ reports a post-mortem examination of a centenarian, male, aet. 107, death due to acute pleurisy, where the spleen weighed 2oz & no mesenteric glands were visible - MacLachlan⁵ reports a case where the spleen was enclosed in a cartilaginous envelope. Boyd gives the average

1 Charcot. Lectures on Senile Diseases. New Syd. Soc. Trans. - p 36

2 Boy, Leissner. Ibid. p. 505

3 Roquet. Ibid p. 37.

4 Rolleston - Scientific Papers & Addresses - I, III

5 MacLachlan - Diseases & Impairments of Advanced Life - p. 10.

weight of the spleen in persons upwards of 80 years as in males 4.27 $\frac{1}{2}$, females 3.46 $\frac{1}{2}$, as compared with 7.12 $\frac{1}{2}$ and 6.13 $\frac{1}{2}$ respectively, in persons between 30 & 40 yrs. Its tissue is firmer & less friable, & on section we find that most of the follicles have atrophied or disappeared, & the pulp comes to resemble a mass of connective tissue permeated with vessels. The blood is more watery in old age, the solid constituents being diminished, especially the corpuscles:—

Table of the Composition of Blood (Devis.)²—

1000 parts of healthy Blood—males—

Age.	Water.	Solid Residue.	Fibrin.	Red Corp. ³	Albumin.
25	732.0	268.0	2.5	181.4	60.0
70	740.0	210.0	2.7	132.3	56.0
80	781.0	219.0	2.5	130.4	61.0

1000 parts of healthy Blood—females—

22	780.0	220.0	2.5	133.4	60.0
74	745.0	255.0	2.5	171.1	55.0

Simon³ quotes Bequerel & Rodier as saying that Cholesterol increases progressively after 40 & 50 years of age—that is, there is decrease in specific constituents & increase in fatty and aqueous matters. Leichtenstern⁴ states that the haemoglobin is always increased in amount after 60 years of age—the arterial blood however is darker in colour than

1 Boyd. Ibid.

2 Simon, Animal Chemistry. ~~Trans.~~ Soc. Chem. Vol T, p. 237.

3 Ditto . . . Ditto: p. 23

4 Leichtenstern:— Untersuchungen über den Hämoglobingehalt des Blutes in gesunden und Kranken Zuständen. S. 29.

in the adult from imperfect aeration in the lungs. The blood is stated to coagulate more rapidly than in the adult but Symonds¹ states that the coagulum is not so firm as that of the adult. Richardson² drew attention to the fact that in prolonged death from old age without obvious disease it is common to find fibrinous coagula deposited, the development of these depending on the condition of the respiratory system - if respiration be free & blood well oxygenated the coagula will be firm large & attached to the vessel wall but if respiration be difficult for some time before death the coagula will be less compact, imperfect & less securely attached.

Circulatory System. This system shows the most important changes from a clinical point of view, the usually pathological condition of the heart & blood vessels influencing each organ of the body & modifying its changes. The change in the arterial walls is the first to be noticed on physical examination as a rule, the walls losing their elasticity³ & becoming more rigid, the muscular & elastic layers becoming more fibrous, and often being the seat of atheroma & calcareous degeneration. This rigidity of the arterial walls causes them to yield more slowly to the impulse of the blood

1 Symonds - Ibid. p. 77.

2 B. W. Richardson; - "The Cause of the Coagulation of the Blood," p. 82

3 Foster. Physiology, 6th Edn., p. 365

Symonds - Ibid p. 77

Ray. Journal of Physiology, Vol. III. p. 125

stream & contraction is also slower & not so complete, hence the entrance of the blood into the capillary area tends to become intermittent instead of constant, the blood pressure falling in the capillaries & rising in the arteries from accumulation of blood¹. At the same time growth having ceased the blood is not required in such quantity & this fact along with the fall in blood pressure allows many of the capillaries to wither. The veins are found more dilated & their walls thinner than in youth - this may be explained in part by the fact that in youth growth is going on & calls for a large supply of arterial blood, in part by the fact that there is a smaller amount of connective tissue in the venous walls than in the arterial. In youth the arteries & veins contain about equal portions of the total blood, but in old age the veins contain twice as much as the arteries². These facts also explain the greater frequency of venous haemorrhages in old age, & arterial in youth.

The condition of the arteries, & its effect in raising the blood pressure, calls on the heart for greater work - the normal heart always having a spare fund of potential energy responds to the call and gradually its walls become hypertrophied - Balfour³ states the heart "has long been

¹ Balfour - "The Senile Heart" p. 15.

² Rogel. Ibid. p. 38.

³ Balfour. Ibid p. 22.

known to be hypertrophied in all old people" - Bizot¹ supports this view & states that the hypertrophy is mainly limited to the left ventricle but it may also affect the right. Maclellan² found that the heart retains its size if it does not actually increase in dimensions, Columbein³ that the heart does not as a rule participate in the general atrophy of the body but rather increases in dimensions & volume. Charcot⁴ says that the heart eludes the usual law of atrophy & that it "may even undergo a real hypertrophy in some old people" - These many & various opinions will illustrate the point mentioned above, that most writers on old age have studied pathological old age & not physiological. In rare are the opportunities of seeing physiological old age - I have found the heart changes almost constant, but varying in proportion to the arterial changes & I prefer to consider them pathological as Charcot does. Boyd⁵ found the heart to increase ^{in weight} from 11.36⁶³ in males 30-40 to 12.13 in males 80 yrs & upwards & from 9.453 in females 30-40 to 10.27⁶³ in females over 80 yrs of age. Cleudwinig⁶ found that the senile heart exceeded the normal average in weight by about $\frac{1}{2}$ part;

1 Bizot: - "Recherches sur le Cœur et le Système Artériel chez l'homme" -
Mémoire de la Société Médicale d'Observation - T. I. p 262.

2 Maclellan - Ibid. p. 9.

3 Columbein - Lectures on General Pathology. New Syd. Soc. Trans. Vol 7. p 106.

4 Charcot - Ibid. p 28.

5 Boyd. Ibid.

6 Cleudwinig - Med. - Clin. Transactions. Vol XXI, p. 53.

the average weights in males under 60 yrs of age (excluding cases of Phthisis & morbis cordis) being $9\frac{1}{5}$ oz, in females $7\frac{1}{3}$, while above 60 yrs the male heart averaged $11\frac{7}{11}$ oz, female $9\frac{1}{2}$ oz. Bizot¹ points out that the auriculo-ventricular orifices progressively enlarge, but that the arterial mouths enlarge equally only till middle life, & that after then the aortic enlarges more rapidly than the pulmonary. White patches are often found on the heart in old age some of which Bizot considered senile & some inflammatory, but they are probably all inflammatory as suggested by Paget² whose view was also accepted by Rokitausky³ - they can usually be dissected off as a false membrane. Fatty changes are very common in the myocardium, the change being almost constant according to Charcot⁴. Atheroma of the coronary arteries is common & at times goes on the capillaries supplying the heart wither as the other capillaries do, leading to diminished nourishment & failure of the organ.

Respiratory System - The cavities of the Larynx & trachea become dilated as age advances, always in Senile marasmus & proportional to it (Rokitausky)³ - the walls of the Larynx become more rigid & the extent of the cavity causes the deep voice of early old age, while, as age advances still further, the pneumoniae

1 Bizot - Memoirs de la Soc. Med. d'Observation, Tome IV

2 Paget. Medico-Chirurgical Trans. - Vol XXIII -

3 Rokitausky - Pathological Anatomy - Syd. Soc. Trans., Vol IV, p 136

4 Charcot. Ibid. p 30.

becomes contracted & rigid & this with the muscular weakness
 in the mouth & throat cause the voice to become hoarse & feeble -
 the impediments in speech so often found in the aged depend also
 on the loss of teeth, the disproportionate size of the lips and the
 falling in of the cheeks. On account of the change in the
 ribs the chest becomes flattened laterally at the upper portion,
 the intervertebral cartilages shrink & so cause shortening of
 the chest cavity - as this shrinking of the intervertebral cartilage
 is more evident in the anterior portions we have a forward
 curvature of the spine produced so that the chest cavity is
 diminished in each direction - The lungs are smaller
 than in the adult but the weight is only slightly reduced
 & may even be increased - this increase in weight may be
 accounted for by the large amount of secretion usually found
 in senile lungs & by the large amount of foreign matter which
 is daily increased. Boyd¹ gives an increase in males & decrease
 in females, males 80 upwards average 54.76 g, females 33.45;
 between 30 & 40 yrs males 52.76 g females 36.38. The lungs are
 often surrounded by a considerable amount of clear fluid -
 The lung tissue gradually assumes an emphysematous appearance,
 from atrophy of the alveolar epithelium thickening of the capillaries,
 neighbouring air cells fusing. Laennec² says "in old subjects
 the lungs present remarkable characters, the calibre of all

¹ Boyd. *Ibid.*

² Laennec: *Diseases of the Chest* - Dr. Forbes's Trans. 3^d Edit. - p. 148.

their vessels seems diminished, they become in some sort ex sanguine; the partitions of their air cells appear thinner than ^{natural} normal, on which their substance rendered more rare, becomes less elastic, & this yielding to the atmospheric pressure on the opening of the body, they are found to occupy not more than one third of the cavity of the pleura." Hovrman & Dechaubri made a special study of senile lungs, chiefly in connection with pneumonia, confirmed Rennee's observations & described 3 types of Senile Lung.

a. In plump fleshy vigorous old people with capacious thorax as in adult - lungs scarce & petrie on chest being opened, colour ashy grey with deep black spots & lines - the heart & great vessels hidden by expanded lung, pleural cavity dry, differ little from adult lung - crepitation distinct on pressure. If there is lateral flattening of the chest we find the interlobular fissure vertical so that one lobe of the left lung is directly in front and the other behind, while on the right side the middle lobe projects downwards & the lower lobe becomes elevated behind it, so as to form the posterior fourth or more of the summit of the organ - (thus an apparently apical pneumonia may really be situated in the inferior lobe) - On section small holes are found united like nests of bees - air spaces are larger than in adult but, regular, isolated & distinct - the blood vessels can be traced to the air cells.

1 Hovrman & Dechaubri. Archives Gen. de Medecine - 1835.

b/ In contracted chests, soft parts are flabby & wasted, like type a but smaller, lighter & can be distended only imperfectly - There is abundant fluid in the pleural cavity - black spots & lines are more evident on the surface of the lung - crepitation on pressure less loud & more diffuse than in adult - On section the air cells are found to be no longer round but elliptical, the vessels elongated & less numerous - the air cells are deformed but still isolated.

c/ The lungs are wasted into crumpled up masses, surface irregular, pressed close to the spine - large amount of serous fluid in pleural cavity - Lungs appear livid & flabby, have lost their conical form & may be larger at the summit than the base. The lobes are sometimes only united by a thin flat pedicle leaving them as it were floating - Inflation scarcely increases their volume, very light, crepitation dull & prolonged - On section the lungs are found spongy & resembling a torn network, there are few blood vessels to be seen & all lobular division is effaced.

These different 'types' should rather be looked on as different stages in the same change - the collection of fluid is explained by the fact that the thoracic wall cannot contract to the same extent as the lungs. From the above changes it is evident that the act of respiration becomes more difficult, inspiration depending chiefly on the diaphragm - on account of the curvature of the spine

The scaleni & Sternocleidomastoid muscles become useless unless the head be thrown back during inspiration - the curvature of the spine also causes relaxation of the abdominal muscles so that forced expiration is more difficult. The lungs have lost much of their elasticity & the area of the membrane exposed to the air is much diminished, hence we do not get so much air changed with each respiration, & as the vascular area is also diminished the blood does not become aerated so freely as in the adult - it follows therefore that we do not have so much aqueous vapour given off from the lungs & this fact increases the tendency to oedema of the lungs, so often found in the aged. The breath is often noticed to have a foetid smell & may be distinctly ammoniacal - Roge^l explains this fact by the diminution of the sweating powers, less animal matter being lost from the skin & so more from the mucous membranes.

Integumentary System. The skin becomes much thinner, especially in its papillary layer, the papillae becoming less distinct & tending to disappear altogether - on account of loss of fat the skin becomes wrinkled and the withering of the capillaries causes the skin to lose its puddy appearance. The epidermis becomes dry through atrophy of the sweat & sebaceous glands. The hair

becomes much less in amount & is very deficient in pigment. This falling out of the hair is not the same as that so often seen in the adult after acute disease, in the former case the hair root is destroyed with obliteration of the canal, while in the latter the bulbous capsule is merely destroyed.

Urinary System. Charcot¹ states that the kidneys maintain their normal size in old age, Boyd's² researches to the contrary however that the kidneys share the general atrophy of the other organs, the weight in persons over 80 years of age being reduced from males from 11.35 oz to 8.25 oz and in females from 10.34 to 6.86 oz as compared with persons from 30 to 40 years old. The atrophy of the muscular coat of the bladder allows that organ to become easily over-distended and its expulsive power is also diminished - The prostate gland in the male is frequently enlarged, but I have often found it to be atrophied rather than hypertrophied and this I regard as the true senile change - as however it does not lead to special symptoms attention is not drawn to the fact and it is overlooked.

The urine is less concentrated, less rich in urea, ureic acid & fixed salts (earthly phosphates, Chloride of Sodium, Alkaline Sulphates & phosphates) but is more turbid from increase of mucus & epithelium & is found to decompose³

1 Charcot. *Ibid.* p. 28.

2 Boyd. *Ibid.*

3 Sumner. *Annual Chemistry*. Ed. Soc. Ed. Vol. 7 p. 166, 167.

Sputum more rapidly. Simon gives the following table showing the differences between the urine of adult life and that of old age: -

<u>Urea</u> :-	Mean.	maximum.	Minimum.
Adults (men)	432	509	357 grains
Old Men	125	189	60 grains

Fixed Salts:-

Adults (men)	260	378	153 grs
Old men	124	151	94 grs.

The great fall in the amount of urea excreted is explained by the comparatively small tissue change (assimilation) going on in the aged as compared with the young & adults.

Reproductive System. General atrophy of the genital organs occurs, the testes & ovaries being often only represented by a small mass of fibrous tissue - The testis may and often does preserve its function in old age but the ovary has usually lost its function before the other senile changes are marked - In the female it is not uncommon to find the uterus, which may be reduced to a cartilaginous mass, prolapsed. The Spermatic fluid is thinner than in the adult & smaller in quantity & contains few or no spermatozoa.

Nervous System - The Dura Mater is often found adherent to the skull, the Pacchianian bodies increased in size & may project through the Dura mater. The Arachnoid & Pia are thickened & the Pia is less vascular - the subarachnoid fluid is in-

creased (taking the place of the shrunken brain) and the ventricles are often dilated. - The brain shrinks especially in the frontal region & the convolutions are found like flattened. - the grey matter is thinner & the whole brain feels firmer & contains less blood. - According to Boyd¹ the male brain loses 2.86 oz & the female 3.32 oz in weight. - The arteries at the base of the brain are thickened & very often arteriosclerotic, but the nutritive ~~arteries~~^{supply} is kept up until late in life as the internal carotid arteries retain their elasticity & calibre (Balfour quoting Beneke)². It has been shown by Virchow³ that the neuroglia tends to predominate over the essential nerve cells but that it becomes permeated by amylaceous bodies (albuminous degeneration). He has also pointed out the frequency with which we find calcareous degeneration of the ganglion cells especially if they be suddenly deprived of their vascular supply. I have described above the ^{in the neuron} changes, which although considered the essential changes of old age (vide supra fol.)

The changes in the eye consist chiefly in flattening of the cornea with in many cases the formation of an "Arcus Senilis" round its margin, this being due to hyaline degeneration of the corneal cells & fibrillae⁴. The iris becomes paler & the pupil more contracted, the pigment of the choroid membrane is

1 Boyd. *Ibid.*

2 Balfour. *Senile Heart.* p. 22.

3 Virchow. *Handbuch der spec. Path.* Vol. I. p. 316.

4 Swanzy. *Diseases of the Eye.* p. 190.

diminished, the lens becomes flattened & may assume a yellowish tint. The aqueous & vitreous humors diminish in quantity, the lacrimal puncta may become obstructed causing a flow of tears on to the cheek.

In the ear the ossicles tend to become fused into one bone & there is often a bony deposit found in the mastoid cells - the tympanic membrane is dry & thickened & may be ossified. The wax is diminished & the fluid in the inner ear is less in amount.

In the nose the Schneiderian membrane is drier than in the adult, secreting less mucus & the flow of tears into the nose being often obstructed - hence the ^{sense of} smell is diminished from local causes as well as the central nervous changes.

Taste is not so acute in the aged as in the adult but is retained longer than most of the other special functions - the deficiency is partly due to the drier condition of the tongue & also to the diminished power of smell. The special senses are also diminished in power from atrophy of the special nerves themselves.

Tactile Sense is diminished partly from the drying and hardening of the skin & partly from general retardation in the response of the nervous system.

The Intellect may remain good to the end, though failure in memory (especially for recent events) is one of the earliest signs of old age - The intellect is the last function to reach

full development, & only does so as the body begins to fail further as life is prolonged, one is always gaining further practical experience, & the benefit of exercise to the intellectual powers is well shown in some of the most noted men of our country, who have done good lasting work after they might well be considered to have reached old age. The loss of memory for recent events is due to the impressions made on the sense brain being fainter, & also to the diminution in the power of attention.

Locomotion System. - The bone changes in the skeleton are perhaps the most appreciable in the body, & have been made a special study of by the late Sir Genx Humphry - the bones though not changing much in size & shape become thinner, lighter, & weaker, the animal matter gradually giving way to mineral, the nutrient foramina becoming contracted and it may be obliterated. The sub-perosteal growth that has been going on through life may continue to advanced life though more slowly, but absorption is always going on from the interior of the bones & more especially so at the cancellous & most vascular parts, the marrow spaces becoming larger from absorption of the bony layers - the bony matter may, though not always, become more fatty - it is thus seen that the changes weaken the bone & the being more marked in the cancellous portions, we here have the explanation of fractures being more frequent near the ends of the long bones

in the aged than in adults. The effects of this change are most frequently shown in the neck of the femur, where the strength of the part depends on the peculiar arrangement of its bony layers; this arrangement being disturbed by the above changes, accounts for the weakness of the part allowing fracture of the neck of the femur to be so common an accident among the aged. Humphry² points out that this change takes place earlier in women than in men, & attributes this fact to the earlier cessation from active work in the former, & less out-door exercise, as well as to the naturally greater tendency to adipose degeneration in women. These facts must be noticed in considering the greater frequency of fracture of the neck of the femur in women, as well as the fact that the neck of the bone makes a smaller angle with the shaft in woman than in man.

The skull as a rule becomes thinner & lighter like other parts of the osseous system, the cellular tissue between the tables being removed,³ but Humphry⁴ points out that in some cases there is distinct thickening of the skull, especially in the Calvarium, this depending on diminished pressure from the brain and consequent greater afflux of blood. The sutures of the skull

1 Gray's Anatomy - 11th Edit. p. 238.

2 Humphry, "Old Age" p. 16

3 Symonds, *ibid* p. 78.
Roget, *ibid* - p. 36.

4 Humphry, Treatise on the Skeleton.

are commonly obliterated, first on the inner & lastly on the outer surface!

The jaw bones being so largely composed of cancellous tissue show the senile changes most markedly, this fact having long been taken notice of in judging of the age of a person at death from examination of the skeleton only. The atrophy of the cancellous tissue leads to the loosening of the teeth & the falling out of them. The cases collected by Humphry² show the change to be earlier in women than in men - among men over 80 years of age the average number of teeth was found to be 6, in women only 3. Of the men 25 per cent. had no teeth while of the women 48.2 per cent were without. It was also found that the teeth left the upper jaw earlier than the lower, and the molars & premolars regions earlier than the incisor & canine regions, that is, the teeth left the most cancellous portions of the bone first. In time there is hardly a trace of the alveolar portions left, so complete is the absorption, & the teeth having fallen out, the action of the muscles in chewing is altered, causing the body & ramus of the lower jaw to be in more or less of a straight line - hence the aged lower jaw comes to resemble the infants in shape, but apart from the size, there is the essential difference that the infants jaw has, an alveolar process which the aged jaw has not.

The spine comes to be curved forwards, this change depending largely on muscular weakness (the erect posture depending

1 Rogel. Ibid. p. 36.

2 Humphry. Old age. p. 17.

on the action of the muscles of the back) ¹ but also to some extent on absorption of the bodies of the vertebrae & intervertebral cartilages, this absorption being more evident anteriorly than posteriorly. The drying of the intervertebral cartilages & joints, causes the spine to become much more rigid.

The medullary cavities are enlarged throughout the long bones & the marrow itself is found to be more of the consistence of oil. ²

The cartilages of the body tend to atrophy, but not to such an extent as the soft parts - the loss in height in old age depends partly on absorption of cartilages, (especially the intervertebral) but more still on the stopping referred to above - As a rule the cartilage remains soft, but it is very liable to undergo calcareous degeneration - Humphry ³ has "invariably found the costal cartilages soft in old people in whom he has had an opportunity of making an examination after death" - Mac-lachlan ⁴ states that the true ribs are wholly ossified in a third of the cases over 60 years of age, & after that age the first & second are always ossified - Symonds ⁵ finds scarcely any trace of cartilage between the ribs & sternum in old age.

The joints become stiff as age advances, from thickening of the fibrous tissue & also the synovial fluid being less in quantity, & the ligaments dry, dense, & less elastic. This stiffness of the

1 Vide supra, Vol: 44.
 2 Symonds. Ibid. p. 79.
 3 Humphry. Old age. p. 22.
 4 Mac-lachlan. Ibid. p. 12.
 5 Symonds. Ibid. p. 79.

joint is beneficial in so far that the weakening of the muscles (from atrophy & loss of nervous power), renders them unable to control very loose joints.

The muscles become atrophied, pale coloured & flabby, & are found to respond more slowly to stimuli! The muscle cells undergo simple atrophy & are very liable to undergo fatty degeneration, leading to wear & action & even paralysis.

Bichat² observes that the irregular action of the muscles in the aged is generally accompanied by a deterioration of their substance, indicated by greater paleness & the assumption of a light yellow colour as if an approach was made to their conversion into sebaceous matter (fatty degeneration).

He remarks that this change is more commonly observed to take place in the deep-seated muscles of the back, which occupy the longitudinal spaces between the processes of the vertebrae, and that it does not affect the muscular system generally but only a small number of isolated muscles.

The same phenomenon has been noticed in muscles that had long been paralyzed.

The Tendons sheaths contain less synovial fluid so that movement is more difficult & may be painful.

1

2

Bichat - Anatomie Générale - tome III, p 336.

Diagnosis and Clinical Examination -

In observing illness among the aged, the first thing that strikes one is, that the symptoms may be very mild in the presence of severe & almost surely fatal disease - In instances in such cases as pleurisy or peritonitis, where in the adult pain would be a marked symptom, in the aged there may be little or no pain - Vomiting is also much less frequent in brain, kidney & liver disease, & may be entirely absent even when the stomach is found to be organically diseased, e.g. Cancer. Disease of the kidneys is no doubt often overlooked as the urinary symptoms may be slight, & I have twice found considerable albuminuria when there were *no* symptoms pointing to the kidney being at fault. Another patient ^(male, aet. 76) I am periodically called to on account of retention of urine, not on account of any pain caused, though the bladder may be greatly distended, but simply because he "has not passed water". Charcot & Maclellan² both point out lobar pneumonia as being especially liable to give no distinct sign of its presence, the patient being apparently in usual health, but death suddenly takes place and the autopsy reveals the condition of the lung. This want of symptoms is ascribed by Charcot, as by most other writers on the subject, to independence of the organs - "the organs

1 Charcot. *Lect.* p. 37.

2 Maclellan *Ibid* p. 36.

remain in some degree independent of one another; they suffer separately from one another, & the different lesions of which they may be the seat, scarcely influence the economy as a whole" - but as Charcot goes on to point out, if we examine an aged person in the febrile state (taking the temperature in the rectum) we find the fever runs the same course as in the adult suffering from the same disease - This lack of symptoms would appear to be due rather to the natural senile blunting of the functions of the sensory nerve apparatus including expression of pain, rather than to any "independence of organs" - We have seen above that all the vital functions are diminished & retarded, & sensation is not exempt from the rule - How different is this condition from that in young children where slight disease may give rise to most alarming symptoms, the nervous system in children being so much more active & sensitive.

Diagnosis is further complicated by the fact, that several chronic diseases may co-exist for long periods & cause some modification of each other - further allowance must be made for change in the various functions due to old age alone, and for changes in topographical anatomy.

Previous History - The aged are generally found to come of a good healthy stock, often giving a history of

Charcot. *Ibid.* p 35.

many aged relatives - Humphry found that 55 percent had been in comfortable circumstances, 35 per cent had been "poor" and only 10 percent "affluent."¹ The comparatively small proportion of "affluent" persons is probably due to errors in diet and to greater wear & tear especially of the nervous system. At the annual meeting of the British Medical Association in 1887 Dr. Druydale² read a paper pointing out the great advantage^{to} those in easy circumstances had, over the poor, from the point of view of mortality - ~~He however~~ ^{Vilfernié} studied the deaths among adults ^{in Paris}, finding that among persons 40-50 years of age at death, the ~~rate~~ ^{death} rate among those in easy circumstances was 8.3 per thousand, as compared with 18.7 per thousand among the poor. Russell found that in England & Wales in 1874 the mean age at death among the richer classes was 55 yrs, while Richardson & Chadwick found the mean age at death among the working classes in Lambeth 29½ yrs. When we compare these figures with Humphry's it is evident that although the affluent may live to a fair age, some form of disease must cut them off before reaching extreme old age, & the commonest class of disease at that time of life is of the digestive system. As bearing out this suggestion we find in Humphry's Records that of the aged, only 15 per cent were "large" eaters, while 20 per cent. were "small" eaters, and

¹ Humphry. Old Age. p. 126.

² Druydale - "On the Influence of Easy Circumstances on Longevity" Brit. Med. Journal. Aug. 20. 1887.

and 61 per cent. had been "average" - Also 5.3 per cent. had been accustomed to $\frac{1}{2}$ -1 lb of meat a day, while 38 per cent took less than this and only 5 per cent. more - 15 per cent. had ~~been~~ ^{taken} no alcoholic drink throughout the whole or greater part of their lives, 40 per cent. had taken a "little", 33 per cent. "moderate", that is one or two pints of beer daily, and less than 9 per cent. had taken more than this daily - Thus we see that moderation in all forms of diet is the most desirable condition.

There is often a history of severe illness but in these cases good recoveries have taken place.

The Height diminishes with advancing years, chiefly from the anterior curvature of the spine above alluded to,¹ along with atrophy of the cartilages - Humphry² reckons the loss in height due to these causes to be 2 inches; Roberts³ found that the maximum height was attained about the 24th-25th year, maintained till the 50th year & then fell away till the 90th year when the individual has lost 3 inches. The Anthropometric Committee found on pumping large numbers, that the curve of height continued to rise till the 70th year, at which age the investigation stopped. The explanation of this continued rise to 70 is that the small & weakly men die before that age. This also is borne out by Sir Geo. Humphry who found that the average height of the

1 Vide Supra. Vol. 32.

2 Humphry. Old Age. p. 65.

3 Roberts. "Centenarians & Life Insurance" Brit. Med. Journal Jan. 1, 1887.

men examined (80-100 yrs) was 67 inches, & of the women 62 in^s,
 so that it is evident, on adding the 2-3 inches for decrease in
 height, that these persons were above the average height,
 which Roberts² gives for the average English-man of all classes as 67½ in:
 and for women 62½ inches.

The Weight decreases with the height, the average of Humphrey's
 men being less than 11 stone & of women 9 stone - which would be
 considerably below the average for ^{adult} persons of their size -
 Quetelet³ states that in old age both sexes lose about 6-7 Kilograms
 (12-14½ lbs) of their weight and 7 centimeters (2.7 inches) of their
 height -

Temperature - Charcot⁴ finds the average temperature in
 the aged, to vary little from that in the adult, the rectal temp-
 erature being 98.9° F. - 100.4° F, that in the axilla being a little
 less or sometimes a little more than 1.8° F. less than these - It
 was found by Wunderlich⁵ that from the 60th-year onwards, the
 temperature gradually rises, and "about the 80th-year the mean
 temperature approaches that of infancy" - The temperature of
 the aged therefore in health is the same as in the adult if es-
 timated per rectum, but the axillary temperature is somewhat

1 Humphrey. *Old age*. p. 65.

2 Roberts. *Ibid.*

3 Quetelet - *Annales d'Hygiène Publique* tome x. p. 27.

4 Charcot. *Ibid.* p. 225.

5 Wunderlich. *Temperature in Disease*. New York & Co. Trans. p. 99.

lower. This lower axillary temperature is accounted for by the senile changes in the skin, its glands & its diminished vascular supply, these conditions causing a diminished loss of heat, & so compensating for the loss of animal heat due to cessation of growth, & general inactivity of the organs & tissues. In disease it is usual in the aged (as in all debilitated persons) to find the temperature about $1-1\frac{1}{2}^{\circ}$ lower, than would be expected in the average adult suffering from the same disease, and this change requires to be noticed between 40 & 50 years of age - Wunderlich¹ goes so far as to say that given the disease & the course of the temperature, one can diagnose the age with tolerable certainty.

As a rule the temperature in the aged is more sluggish & less susceptible to sudden changes than in younger persons, but the aged are on the other hand "much addicted to collapse temperatures, and in them these often sink to a very low level" - Temperatures of 105.8° F and 95° F (per rectum) are both signs of great gravity.²

Alimentary System - In making the physical examination of an aged person, we must remember that the tongue is naturally drier than in the adult, and the thinness of the abdominal parietes allows of a freer examination of the abdominal organs, unless the intestines be distended)

¹ Wunderlich - *Ibid.* p. 209.

² *Chesed. Ibid.* p. 228.

by flatulence. The Liver is diminished in size & the Gall-bladder often contains calculi that may be felt.

Mastication being deficient from want of teeth, & the various digestive fluids being deficient from atrophy of glands, we find that usually the digestive process is not properly carried out. The muscular weakness of the stomach and intestines lead to frequent constipation & flatulence, with all the bad effects from absorption of toxins from the bowel. The bile being thicker than usual we lose some of its aperient & antiseptic action. There is also less absorption, the many of the lacteal vessels & mesenteric glands disappearing. There is often marked loss of appetite, but this is not to be misinterpreted on too much as, growth having ceased, so much nourishment is not required.

Hæmopoietic System - We must allow for the usual anæmic appearance & note the diminished area of Splenic dulness. Although the lymphatic glands are diminished in size, they are often more easily felt through the thin wasted skin of the axæ.

Circulatory System. We usually find the area of relative heart dulness increased, it may be stretching to the lower border of the sixth rib, and the apex beat may be felt in the sixth intercostal space. The superficial dulness is however diminished from the overlapping of the emphysematous lung, & generally lies about over the fifth rib, internal

to the parasternal line.¹ This increased dulness is due to dilatation & hypertrophy of the heart combined, and is the result of the changes mentioned above.² The Heart-Sounds are normally found unchanged on auscultation, or if anything a little duller than in the adult - the first sound especially is apt to be found duller & somewhat lengthened, but no murmurs are to be detected. It is very common to find irregularity of rhythm & strength, apart from any structural change, & of the two intermissions is the more frequent. Boylston³ points out that this irregularity of action is regular, the heart missing a beat periodically so as to gain a rest during which it previces. Should the intermission become irregular it is a sign of threatened asystole & the patient also begins to complain of dyspnoea on exertion & what Balfour calls *precordial anxiety*,⁴ not real pain, but the patient now becomes aware that he has a heart - According to Maclellan⁵ these irregularities of heart action occasionally disappear under the influence of inflammatory diseases remote from the heart, & return with the subsidence of the inflammatory action - This would seem to show that the intermissions were

¹ Veivort-Stuart. Medical Diagnosis. p. 205.

² Vide supra fol. 29.

³ Boylston. Med. p. 498

⁴ Balfour. Sense Heart. p. 35.

⁵ Maclellan. Med. p. 376.

due to deficient stimulus or nervous excitement, but on the other hand we find that digitalis (a sedative to the heart) will also prevent these intermissions. Balfour¹ ascribes the irregularity to the nerve influence, namely the interference of the sinus & ventricular rhythms with each other, due to excitement of the Vagus - Excitement of this nerve chiefly affects the sinus & auricles & has little effect on the ventricles so that the ventricles beat independently of the sinus venosus and auricles - Irregularity in the strength of the beats is a common accompaniment of the arrhythmic condition² & is explained by the fact that now & then the impulse from the auricle corresponds in time with the ventricular systole & causes an extra full beat. At all ages anaemia, especially in its haememic form, is very apt to cause this irregularity of the heart action, and we have seen above that the blood of the aged is always more watery than that of the adult - the poor quality of the blood means that the heart does not get its due supply of nourishment & calls for increased action through the Katabolic nerve (cardiac branch of the Sympathetic); but the cardiac muscle not being well enough nourished, cannot respond to the accelerated action, & the anabolic action of the Vagus (Inferior Cardiac nerve) is called into force which weakens the auricular contractions,

¹ Balfour. *Sense Heart*. p. 40

² Balfour. *Ibid.* p. 50.

lessens the stimulus from the auricles to the ventricles, & diminishes the excitability of the ventricles - If the inhibition is strong we have the ventricular & auricular rhythms separate although each may be regular in itself. The myocardium being liable to degeneration & its blood supply becoming inefficient it is liable to dilatation & failure, & the condition of the organ is one of the most important points with regard to prognosis.

The pulse is affected in age on account of the loss of elasticity in the walls of the aorta & larger arteries, the blood stream being less continuous & therefore making the radial pulse more sudden in its onset & fuller.² Bizot³ points out that the wave of blood sent through the aorta is larger in old age than in the adult, hence if the arteries are healthy the pulse feels stronger than in the adult, and it is often found that the radial artery is healthy, hence the apparently stronger pulse so often observed in the aged. At all ages cold powerfully affects the volume and strength of the arterial pulse, diminishing both, but more especially is this noticed in old people, therefore in examining the pulse it is well to take that wrist which has been under the bed clothes longer.

1 Balfour. *Ibid.* p. 49.

2 Broadbent on "The Pulse" - p. 166. (1890)

3 Bizot. *Brit. For. Med. Review.* Vol. VI, p 48.

In every case the radial pulse should be compared with ~~that~~ of the heart as a whole, as it is often found that some of the cardiac contractions are too feeble to make their impulse appreciable at the periphery - thus in judging from the radial pulse alone it might appear that there was absolute intermittent action of the heart, whereas the action might be regular in rhythm but irregular in force.

Authorities differ considerably in their statements as to the average frequency of the pulse in the aged. Humphry¹ found it to average 73-74 in men and 78-79 in women - Landris² found it to be 79 at 80 years of age & between 80+90 yrs more than 80. Hourman & Dechambre³ state that "it is in old age that the pulse presents extremes of slowness or of frequency, but the first is the exception, the second is the rule" - Boy-Lessier⁴ on the other hand finds the average

adult pulse rate to be 68 and that in old men seldom more than 72 per minute. ^{Roget found that the heart beats often did not exceed 50 & were sometimes less than that} ⁵ On 100 observations on 15 different persons aged 70-93, when in their usual health I found the average to be 77.4. Humphry's investigations proved that most old people had been above the average height in adult age, it has often been noticed that the pulse is less frequent in tall persons. In febrile disease the

1 Humphry
 2 Landris-Skiering. Physiologie. 4^e Edit. p. 123.
 3 Hourman & Dechambre. Arch: Gen: de Med: Tome IX, p. 357.
 4 Boy-Lessier. Ibid p 515.
 5 Roget. Ibid. p. 39.

pulse in old age is generally found to be less rapid than that of the adult, especially in the early days of the disease - the pulse is often found to be about 80-90 while there is considerable rise of temperature - the longer the fever lasts, the more frequent does the pulse become, & rarely does an aged person recover if the pulse reach 120 beats per minute.

Arterio-sclerosis & atheroma have been allowed for almost constantly, and the veins are very liable to become varicose, e.g. hemorrhoids.

Respiratory System - The respirations become more frequent in the aged, but each respiratory movement is smaller, on account of the changes in the thoracic walls & also because the lung is rarely the seat of simple changes only; as a rule there is some pathological change added, the respiratory system being peculiarly exposed to external influences. Boy-Tessier has found no single lung free from disseminated chronic pneumonia, the result of ^{the} introduction of some foreign body - normally the rate of respirations is from 22-24, Humphry² gives 20 for men, 22.5 for women, but they become much more rapid in the presence of fever & we may get 30 respirations a minute with little or no thoracic change to account for it, the reason being that the movements are small, and

1 Boy-Tessier. *Ibid.* p 517.

2 Humphry. *Old Age*. p.

so must be more rapid to allow of the requisite oxygenation of the blood - The lungs become more or less emphysematous and the secretion is usually increased - On percussion the note is higher in pitch than in the adult, the parietes being thinner & the lung more ramified - on auscultation the sounds are more or less emphysematous - The lungs must be closely watched in every case of illness which confines an aged person to bed, as oedema or hypostatic congestion, is very apt to supervene from the recumbent position - During sleep a form of breathing somewhat resembling Cheyne-Stokes breathing is often observed; the respirations gradually diminish in intensity & come to a stop, a pause of surprising length follows, but breathing is resumed with a snort and continues more vigorous for a time - there is not the gradual rise following on the pause which is found in Cheyne-Stokes breathing -

Integumentary System - The skin has a dry feeling from atrophy of the sweat glands, "Sweating can hardly be induced by any amount of heat or exercise & Sudorifics too generally fail in their intentions" - Inflammatory conditions of the skin are very liable to go on to fungous.

Urinary System - Stricture is generally more frequent than in the adult - should the bladder not be

emptied at the proper time, distention is apt to follow from the muscular atrophy with consequent retention of urine. Great care must be taken in sterilising all catheters &c used as the senile urine is found to be more liable to septic infection than in the adult.

Nervous System - The sensory functions are all dulled & retarded, both those of ordinary sensation and the special senses - The intelligence is often good to the end but the power of concentrating attention is now deficient; memory is bad for recent events but may be good for events of years gone by - dates and names ~~are~~ often noticed while the first things forgotten.

Locomotion System - The changes in the bones & joints have already been described - Stiffness of the latter is often complained of from hardening of the fibrous tissues - the so-called rheumatic pain of old age frequently depends on the dryness of the ligaments and tendon sheaths -

Disease among the Aged.

It is difficult to give trustworthy statistics of the frequency of disease, ending in recovery, among the Aged, or of the proportional frequency of any one disease - It is in Hospitals & Almshouses for the Aged, that such statistics might be prepared, but then allowance would have to be made for re-admissions, concurrent affections in the same person, and the fact that the proportion of sick & healthy would be much greater inside these institutions than outside. Experience teaches however that if we consider the whole year, we get more diseases of the Respiratory System than any other, these affections being especially frequent from September to May, and at this time of the year causing the majority of deaths among old people. Next to these I would place Diseases of the Circulatory System, these being followed by Nervous affections & Alimentary diseases. We may however note that alimentary symptoms are often developed secondary to some other disease, for instance, Cardiac failure.

The Aged may suffer from practically all the diseases from which younger people suffer; but many diseases, e.g. most of the exanthemata, rarely affect the same person twice, & thus the aged are seldom found to be suffering from them, having already become immune.

In the earlier period of Senescence we find chiefly dyspeptic, gouty, rheumatic & renal affections; later the venous dilatation & senile changes in the arteries lead to congestion of the organs & passive hæmorrhages, e.g. hæmatemesis, melæna, with development of varicose veins in rectum & bladder. As the changes in the blood vessels become more marked we get apoplexy and softening of the brain.

The Prognosis is always guarded in the Aged, as great changes may occur in a very short time, such seemingly trivial circumstances as a fall in the temperature of the atmosphere or some slight exertion, (yet proving too much for the patient in his debilitated condition) turning the apparently favourable course of the disease in a downward direction.

When we study fatal disease we can be more definite - I have already pointed ^{out} that according to my ideas on the subject, death from Old Age must be exceedingly rare, yet when we study the causes of death as certified to the Registrar-General we find a large number of deaths ascribed to Old Age; although probably many of these deaths were due to some pathological condition added to Old Age, we may take it that the disease was obscure & therefore not recognised.

If we look at the years 1895-1899 inclusive we

find the following facts for England & Wales: -

Table A. Deaths from Old Age -¹

Year.	Deaths from Old Age.	Rate per 1,000,000.	Males	Rate of Males per 1,000,000	Females	Rate of Females per 1,000,000.
1895	29842	982	12845	873	16997	1087
1896	26168	850	11130	746	15038	947
1897	28618	921	12260	815	16358	1022
1898	28698	914	12148	799	16550	1023
1899	31477	992	13522	879	17955	1097

The average death rate from Old Age during these five years is thus 0.931 per thousand living, and in the Ashbourne Rural District during the same period, the average death rate from Old Age was 1.112 per thousand living.

If we consider the cases only where death occurred at the age of 70 years & upwards, in the Ashbourne Rural District during the same period, we find there were 255 such deaths, 127 males and 128 females - of these 29 males & 28 females were stated to die from Old Age simply, and 24 males & 21 females from Old Age with some secondary symptom or disease added. We may compare this condition with that found by Maclellan² at the Chelsea Hospital, where out of 845 deaths (at ages between 50 & 90) in thirteen years only 3 were ascribed

¹ Tables of the Registrar-General - 1899.

² Maclellan. *Ibid.* p 31.

to Old Age, these all being men 82 years of age. These deaths in the district I have mentioned are best expressed in the following table: -

Table B. Deaths from Old Age in Ashbourne Rural District,
1895-1899.

	Males	Females	Total
Old Age -	29	28	57
.. Syncope	7	7	14
.. Heart Disease	1	.	1
.. Bronchitis	2	5	7
.. Ch. Bronchitis	3	.	3
.. Congestion of lungs	2	1	3
.. Diarrhoea	3	.	3
.. Embolism	1	.	1
.. Paralytic Stroke or apoplexy }	1	2	3
.. Paralysis	2	.	2
.. Dementia	.	1	1
.. Cystitis	1	.	1
.. Influenza	.	2	2
.. Ch. Rheumatic arthritis }	1	1	2
.. Gangrene of foot	.	1	1
.. Abscess & Inflamm ⁿ of foot }	.	1	1
Totals.	53	49	102

I may here draw attention to the unsatis factory terms often used in death certificates, e.g. Paralysis, Embolism as used above. The former I have considered as the after effects

of Cerebral Apoplexy & the latter as meaning Cerebral Embolism.

Considering all the deaths at or over 70 years of age & grouping the diseases as far as possible by systems we find: -

Table C. Deaths in Ash: R. Dist., with Causes -

	a.	b.	c.	d.	e.	f.	g.	h.	i.	j.	k.	l.
	Males	Included in Table B	Total Males	Total by Group	Percentage of Males.	Females	Included in Table B	Total Females	Total by Group	Percentage of Females	Total, M & F.	Percentage Male at Cause.
Old Age.	11	29	29	29	22.83	.	28	28	28	21.87	57	22.35
Disease of Heart.	25	8	29	29	22.83	20	7	27	27	21.09	56	21.95
" " Nervous System	14	4	18	18	14.17	23	3	26	26	20.31	44	17.25
" " Resp. System	11	7	18	18	14.17	15	6	21	21	16.40	39	15.29
" " Alimentary System	4	3	7	7	5.51	10	.	10	10	7.81	17	6.66
Influenza	6	.	6	6	4.72	4	2	6	6	4.68	12	4.70
Cancer	5	.	5	5	3.93	5	.	5	5	3.90	10	3.92
Urinary Disease.	5	1	6	6	4.72	1	.	1	1	0.78	7	2.74
Miscellaneous	8	1	9	9	7.08	1	3	4	4	3.12	13	5.09
Totals:-	74	53	127	127		79	49	128	128		255	

Here we find that the order of frequency is not quite that suggested above for the frequency of disease in the aged, the explanation being that many diseases are recovered from, & also the actually fatal disease may be added to some more chronic one. Further, the mode of certifying death, with regard to the arrangement of primary and secondary causes, varies so much with different men, that judging from the certificates only, the results must

be open to great fallacy.

Examining the groups of disease we can produce the following tables, the columns being the same as in Table "C" -

Table D. Diseases of the Heart -

	a.	b.	c.	d.	e.	f.	g.	h.	i.	j.	k.	l.
Heart Disease	15	1	16			12		12				
" " - Pleurisy	.	.	.			1		1				
" " - Bronchitis	.	.	.			1		1				
Syncope	4	7	11	<u>29</u>	<u>22.83</u>	3	7	10	<u>27</u>	<u>21.09</u>	<u>56</u>	<u>21.95</u>
Dilated Heart	2	.	2			1		1				
Small Heart - fauvroue!	.	.	.			1		1				
Angina Pectoris	.	.	.			1		1				

Table E. Diseases of Respiratory System -

Bronchitis	4	2	6			4	5	9				
" - Heart Failure	.	.	.			1		1				
" - Faulty Heart	.	.	.			1		1				
Ch: Bronchitis	3	3	6			6		6				
" - Dilated Heart	1	.	1	<u>18</u>	<u>14.17</u>	.	.	.	<u>21</u>	<u>16.40</u>	<u>34</u>	<u>15.29</u>
Pneumonia	2	.	2			2		2				
Ch: Pneumonia	1	.	1			.	.	.				
Congestion of Lungs	.	2	2			.	1	1				
Emphysema, Dilated Heart Angina Pectoris	.	.	.			1		1				

Table F. Diseases of Nervous System

	a.	b.	c.	d.	e.	f.	g.	h.	i.	j.	k.	l.
Cerebral Hemorrhage or Apoplexy	5	1	6			16	2	18				
Morbus Cordis, Apoplexy	1	.	1			.	.	.				
Embolism	.	1	1	18	14.17	1	.	1	26	20.31	44	17.25.
Paralysis or Hemiplegia	5	2	7			6	.	6				
Cerebral Softening	3	.	3			.	.	.				
Dementia	.	.	.			.	1	1				

Table G. Diseases of Alimentary System

Acute Gastritis	.	.	.			2	.	2				
Gastro-Enteritis	.	.	.			1	.	1				
Diarrhoea	.	3	3			.	.	.				
Strangulated Hernia	1	.	1			2	.	2				
Obstruction of Bowels	1	.	1			.	.	.				
Peritonitis	.	.	.	7	5.51	1	.	1	10	7.81	17	6.66.
Arteriosclerosis of Aorta	1	.	1			1	.	1				
Gall Stones, Jaundice	.	.	.			2	.	2				
Acute Jaundice	.	.	.			1	.	1				
Sarcina of Hep. Jaundice	1	.	1			.	.	.				

Table H. Diseases of Urinary System

Acute Nephritis	1	.	1			.	.	.				
Ch. Nephritis	3	.	3	6	4.72	1	.	1	1	0.78	7	2.74
Cystitis	.	1	1			.	.	.				
Ch. Cystitis	1	.	1			.	.	.				

Table I. Deaths from Cancer-

	a.	b.	c.	d.	e.	f.	g.	h.	i.	j.	k.	l.
Esophagus	1	.	1			.	.	.				
Stomach	1	.	1			1	.	1				
Colitis and Malignant Peritonitis	1	.	1			.	.	.				
Rectum	1	.	1	5	3.93	1	.	1	5	3.90	10	3.92
Liver	1	.	1			.	.	.				
Spleen	.	.	.			1	.	1				
"Internal"	.	.	.			1	.	1				
Breast-	.	.	.			1	.	1				

Table K. Miscellaneous Causes of Death.

Diabetes	1	.	1			.	.	.				
Diabetic Coma	1	.	1			.	.	.				
Tuberculosis	1	.	1			.	.	.				
Ch. Rheumatoid Arthritis	.	1	1			.	1	1				
General Atherosclerosis	1	.	1	9	7.08	.	.	.	4	3.12	13	5.09
Gangrene	.	.	.			.	1	1				
Abscess of Inflam. of Foot	.	.	.			.	1	1				
Suicide (Thamputation)	1	.	1			.	.	.				
Drowned	1	.	1			.	.	.				
"Natural Causes"	2	.	2			1	.	1				

Summarising the above tables, we find that if we ignore the deaths from Old Age as being open to doubt, the diseases

most often causing death among our old people are, in order of frequency: -

1. Disease of Failure in action of Heart,
2. Diseases of Nervous System (largely due to Apoplexy & other diseases really depending on circulatory changes)
3. Diseases of Respiratory System -

Further we note that a very much larger proportion of women die from Nervous Diseases (chiefly Apoplexy) than men, while a very much larger proportion of men than women die from Urinary Disease. Cancer causes death in the two sexes about equally, & chiefly affects the Alimentary System. The two deaths from Diabetes both occurred in males -

Special Diseases in Old Age.

The older the persons the less likely are they to be found suffering from disease, & the more likely are they to be the subjects of simple old age. The reason of this is, that all those with any predisposition ^{any} to disease & all those of comparatively weak constitution, will probably have died from disease before reaching extreme old age.

The Exanthemata may attack the aged & so the course of the illness becomes more chronic & tends to be of an asthenic

type - The rash is often indistinct being paler than that in youth - there is a special danger of pulmonary complications arising & these must be carefully guarded against - If the fever remain high for any length of time the condition of the heart must be anxiously watched.

Typhoid Fever I have never seen in old age, although Boz. Leisner¹ finds it frequent. Maclachlan² in the Old Land hardly ever met with it over 50 yrs of age. When it does occur the onset is very insidious & many of the usual symptoms are wanting. Broncho-pneumonia & Hypostatic pneumonia frequently appear as complications & call for active treatment by heart tonics & stimulants.

Influenza ^{has} ~~not~~ been responsible for much trouble among our aged during the last few years. The chief features have been Respiratory Complications and great debility & prostration.

Erysipelas is a common ailment & in the aged tends to run a more chronic course than in the adult. There is not so much general fever & the eruption is paler in colour - it may lead to chronic inflammation of the skin & cellular tissue causing a form of elephantiasis.

Rheumatism & Gout rarely appear for the first time in the aged - when present they are usually in a chronic

¹ Boz. Leisner. *ibid* p. 520

² Maclachlan. *ibid* p. 32.

form. The incomplete oxidation of the blood favours the accumulation of fat, leads to imperfect the transformation of the organic acids. Chronic Rheumatism, tends to assume the dry form - I have had the best results from Sulphur continued for several months, but I rarely find that a patient will continue the treatment regularly for any length of time.

Cancer is not found very often among the aged as a cause of death, being more frequent between 45 and 65. Cancer however gradually increases, but death may be due to some other cause. Kingston Fox² found that if we take deaths from cancer & compare them with other causes of death the proportion will be: -

Age	Males	Females
25-35 yrs ...	1 to 59	
35-45 yrs ...	1 to 20	1 to 12
45-55 ...	1 to 11	1 to 7
55-65 ...	1 to 11	1 to 8
65-75 ...	1 to 16	1 to 13
75 & up ³ ...	1 to 36	

Alimentary System.

Thrush is very common & freq. in the aged especially when the patient is much debilitated by disease. In cases

1 Registrar-General's Tables

2 Kingston Fox, "The Liability to Cancer in Old Age" Lancet May 29, 1847.

of Stomach mischief we frequently find small ulcers on the inner surface of the cheeks & tongue. Simple tonsillitis is commonly met with but suppurative rarely.

Difficulty in Swallowing may be induced by anæsthesia of the mucous membrane or paralysis of the muscles of the throat. If the patient sit upright the saliva dribbles out of the mouth, but if the head be kept back the saliva will generally find its way into the œsophagus. I have had such a case under observation for the last three years but have found no benefit from treatment.

Various forms of dyspepsia arise from the want of muscular tone & scanty secretions of the stomach. I have found Strychnine most useful in these cases combined with ordinary treatment of dyspepsia in the adult. Antispasmodic digestives are often of great service.

Flatulence & Constipation ^{are} very frequently met with as a result of muscular atony & deficient secretions. These in their turn set up a general auto-intoxication ~~and~~ cerebral congestion.

The Liver is not specially liable to disease unless there be a history of excess in alcohol. Biliary calculi are frequently found but rarely give rise to any symptoms. Charcot found biliary gravel one of the most frequent affections at the Salpêtrière, but points out that it is often difficult to recognise any symptoms of it. "The most

Charcot *Lev.* p. 35, 36.

we find is a little heavy feeling in the region of the liver, some sickness, slight jaundice, delirium & cerebral symptoms which are more apt to lead us into error than to enlighten us in the nature of the disease" - Charcot explains this phenomenon as due to absence of "sympathetic reaction" - Boy-Teissier¹ however points out that Senility produces a tendency to calculus formation, (the bile being thicker & containing more cholesterol) & so it is in accordance with the general rule of senile changes (that a due relation be kept up between the various functions) that no disturbance should be caused.

Circulatory System -

The heart is the most important organ in the body from a prognostic point of view - the myocardium is very liable to undergo degeneration, chiefly fatty, so is liable to dilatation & may suddenly fail in its action - Heart failure in the aged is to be treated on general principles, digitalis & strychnine being found the most useful drugs.

The arterio-sclerosis so frequently met with affects all the organs, & where the blood pressure is much raised I have found benefit from the administration of Iodide of Potash - the effect, apt to be depressing, must be carefully watched & it is well to give Ammonia along with the salt. Savill²

1 Boy-Teissier. Ibid 572.

2 Savill, on Senile decay. Lancet. March 27, 1897.

considers the ~~change~~ muscular, ("hyper-myotonia") & has found benefit from Nitro-glycerine.

Valvular heart-disease persists in old age, but calls for no specific treatment beyond that of the ~~adult~~ ^{same condition} in the adult.

Respiratory System - 4

When we consider the anatomical changes in the lungs it is evident that they are peculiarly liable to disease. Bronchitis is probably the commonest affection - it may start in an acute form but is very liable to become chronic & to show fresh exacerbation on little provocation. Along with the bronchitis we have emphysema & dilatation of the bronchi with constant excessive secretion - Further the condition of the heart favours stagnation of blood in the lungs & passive congestion, and uraemic poisoning from defective work of the kidneys is a frequent cause & complication of bronchitis. There is always a danger of the bronchitis spreading to the smaller tubes, constituting "Capillary Bronchitis", and this condition is much more serious than if the disease be limited to the larger tubes. The breathing becomes much more difficult & the patient can only get his breath setting up. The paroxysms of severe cough almost choke him, oxidation of the blood is interfered with, the patient becomes markedly cyanotic & nervous congestion occurs in various parts of the body.

Pneumonia is often very insidious in its onset & proves one of the most serious illnesses from which the aged suffer. I have referred above to cases reported by Chancel & MacLachlan, where persons died suddenly when apparently in their usual health & the autopsy shewed advanced pneumonia. The patient often makes no complaint beyond being a little out of sorts, there may be no cough & no pain. The usual febrile symptoms may often be noticed however & the respirations soon increase in frequency. There is rarely a definite initial rigor & though cough is a fairly constant symptom it may be absent altogether. The expectoration has not the usual "rusty" appearance but consists of a little plain mucus & may not even be blood stained. Pain in the head is a very constant symptom. Prognosis is always very grave - Treatment is the same as in the adult but stimulants are practically always required. Convalescence is prolonged and I have several times seen relapses following on the patient's getting up too soon.

Broncho pneumonia is as serious as, or more serious than lobar pneumonia, capillary bronchitis often being associated with it, leading to great dyspnoea & it may be emia. Tonic treatment is required from the first with digitalis and alcohol.

Integumentary System. Prurigo Senilis is one of the most annoying troubles of old age - it consists in an eruption of unpigmented papules chiefly on the shoulders back & outside of the legs. There is great itching which causes the patient to scratch the affected parts causing abrasions of the surface. Very often these cases seem to depend on some toxin circulating in the blood. Any diathetic tendency should be carefully enquired into & treated. Locally I have found Carbolic Acid Lotion (1 in 40) as powerful as anything. Pediculi should be looked for & if found destroyed by the application of Ammoniated Mercury ointment, lightly smeared on the skin, to destroy the parasites & at the same time not to cause too much absorption of Mercury.

Herpes Zoster in the aged is usually attended by severe neuralgic pain which may persist for many months - Quinine I have found as useful a drug as any with the addition sometimes of Cocaine, preferably given hypodermically in the painful region. Sometimes the vesicles are found to contain dark blood stained fluid & the skin beneath may be gangrenous.

Eczema is usually of the chronic dry form, but may also be vesicular - pustular forms are rare in the aged.

Urinary System.

The senile changes in the kidney render the aged very

liable to suffer from uraemia, rarely in its acute form, but usually chronic causing headache, vertigo, dyspepsia, pruritus or pulmonary congestions - hence the importance of routine examination of the urine, & the adoption of a milk diet on the least indication -

Cystitis is more common in the aged, the urine being often retained in the bladder until decomposition begins - Vesical calculus is common - Prostatic gland is often enlarged.

Veneral Disease, does not differ from that in the adult except that there is a great tendency for a chancroid to become gangrenous - Gonorrhoea is less acute & runs a slower course.

Syphilis is a serious disease in old age, the chancere often becoming gangrenous - The secondary manifestations of the disease are irregular in their appearance, but are quickly followed by the tertiary signs.

Nervous System.

The only diseases of the nervous system calling for special mention are Apoplexy, Softening of the Brain, ^{senile} Dementia & Paralysis Agitans.

Attention has already been called to the frequency of Apoplexy as a direct or indirect cause of death, and this frequency is not to be wondered at when we consider the changes in the blood vessels - it is very common to find military

Aneurysms and apoplexy very commonly depend on rupture of one of these aneurysms. The disease is much more common in women than men.

Softening of the brain is generally due to end arteritis, its most usual seats being the corpus striatum, the optic thalamus & the cerebral cortex.

Senile Dementia begins in a very insidious manner, & consists in diminished power of understanding, loss of memory, slowness of perception.

Paralysis Agitans is usually a disease of old age but may begin any time from 40 onwards. It usually begins in separate attacks with an interval of freedom from shaking between, but the interval is gradually shortened until the shaking becomes constant. I have a patient under observation aged 76 (female) who had her first attack four years ago - between the first & second attacks she had an interval of nearly five months, but now she rarely goes a month without.

There is an epileptiform convulsion sometimes met with, which however really depends on heart failure. I have had two such cases, both females. Both had previously been treated with Bromide of Potassium without any benefit but rather the reverse. An occasional course of Cardiac tonics kept the

General Care of the Aged.

There is often great difficulty in getting the friends of our aged patients to pay proper attention to them, all complaints being put down to "old age" and being considered therefore as ills to be borne in the natural course of events—many of these ills may however be much modified by attention to small every day matters.

What the Aged want is quiet & regularity in all things—the general rule is to moderate the various influences which diminish or disturb the activity of metabolism.

The various functions of the body becoming impaired as age advances, it is important that old people should not be exposed to sudden changes in habits & in surrounding conditions, both of temperature and humidity. The more equable the climate the more comfortable will be the closing years of life—there should be no exposure to extremes of temperature hence one advantage, where circumstances permit, of getting our old people away to a warmer climate than that of this country during winter & Spring—a further advantage is that out-door exercise can there be kept up with much more regularity—

The majority of our patients however cannot be sent to South France or Egypt for six months out of the twelve, and to these the constant attention to details of

Treatment, become of still more importance - many of them, even if able to take exercise, it will be necessary to keep indoors on account of their extreme liability to respiratory troubles - it is thus of great importance to have houses built in a dry situation and rooms airy & well ventilated - a temperature of 60°F is sufficient for the day-time, but as old persons generally complain of cold in the night it is well to raise the temperature of the room during sleeping hours to about 65°F . - in all cases separate rooms for day & night use should be insisted on. Night-time proves more fatal than day-time and a few days sudden frost carry away many old invalids!

When possible daily walking exercise should be taken, outdoor if the weather allow; failing this carriage or ball-chain exercise out of doors & general massage of the muscles with passive movements of the joints - this muscular exercise increases metabolism, stimulates the circulation & assists the removal of waste products. The actual amount of exercise will depend on the strength of the subject and on his previous habits - it should always be short of exhaustion & one must remember that the co-efficient of resistance being reduced fatigue follows closely on exertion.

In the Aged we have not growth going on hence the amount of animal heat generated is not so great, this diminution being intensified by the lessened respiratory action & muscular movements - It is therefore imperative to maintain a proper degree of warmth & we must provide extra clothing of a woolly nature (wool being a bad heat conductor) to be worn next the skin - especially at night-time do the Aged complain of cold & so should be thoroughly warm on going to bed, it is well to give a hot stimulating drink like 'Boveril' or Leibig's Extract of meat on getting into bed - cold feet must be specially guarded against. All clothing should be light & warm & so arranged as not to interfere with respiration or other movements.

Attention must be given to the skin which becomes dry rough from atrophy of the sweat-glands - tepid bathing or sponging followed by gentle friction of the skin should be carried out at bed-time each night & if possible in the morning too. I find this one of the most difficult orders to be carried out on account of the rooted idea in people's minds, especially those of the working class, that the patient will "catch cold" - the addition of a little vinegar to the water makes the sponging more refreshing - The secretion of urine being often

diminished in quantity, the sponging of the skin is useful in easing the work of the kidneys also.

Diet requires especial attention - as a rule our old people are encouraged to eat too much, people forgetting that the nutritive function is diminished in old age - only sufficient food should be given to replace the wear & tear continually going - so long as the patient retains his weight & the urea excreted is in proportion to the food taken the amount is satisfactory. The teeth as a rule are few in number unless artificial ones are supplied, the food must be prepared so as to save the cutting action of the teeth - in spite of the preparation by mincing &c. mastication must be encouraged for the sake of the stimulus it gives to the salivary glands. The atrophied condition of the glands of the stomach lessens the digestive power, so that the food must be carefully selected and cooked. Twice cooked dishes such as stews & minces agree well, largely because of the increased tenderness allowing of more thorough mastication. Humphry points out that as age advances the desire for animal food diminishes; I have found that although there is often a disinclination for solid meat, meat soups & broths are well taken, the objection to meat being very

Often the inability to chew it -

The most suitable meats are white fish, poultry (excluding geese & ducks), & mutton - all preserved meats & very fatty meats should be prohibited, although I know an old lady of 84 who takes frizzled bacon for her breakfast every morning - when a couple of years ago she had influenza with marked gastric symptoms her daily request was that she should have bacon for her breakfast: when at last, though with some misgiving, I gave my consent I must admit that her convalescence became more rapid, and the same thing happened last summer when she suffered from Bronchitis with Heart failure.

The fluid should be limited as the secretions are less in quantity, & further the liquid taken dilutes the gastric juice which is often already too weak.

Milk is usually well borne so often forms the most important part of the dietary - it is often better taken if a little seltzer water be added, especially in persons liable to respiratory troubles, where there is often an increase in the amount of mucus about the pharynx.

Eggs may be taken raw or lightly cooked, either boiled or poached.

Vegetables of the cabbage & pea classes should be avoided because of the flatulence they are liable to

cause, but well cooked potatoes, carrots, turnips & vegetable marrow may be used.

Jamniaceous foods may be used but in moderation & not doled out indefinitely as is so often done. Pastries, Cheese rich puddings must be forbidden.

Cooked fruits & raw ripe fruits may be given with advantage.

As to Alcohol it is best to be guided by the previous habits of the individual, it is not well to change any habit abruptly. Alcohol may often be desirable but its indiscriminate use is not unattended with danger - it excites the vaso-motor function, we have seen that normally all the functions are changed in relation to one another - it is therefore unwise to excite ~~one~~ function more than another.

With regard to meals, it is best to have the main meal in the middle of the day where circumstances permit of it - breakfast may be taken at 8 am., a glass of wine or cup of Bovril with plain biscuit about 11 before exercise, dinner at 1 pm., plain tea at 5 & light supper at 8. In the early hours of the morning a small meal, e.g. a glass of wine & a biscuit, should be taken. Heavy meals in the evening should be avoided as digestion excites the circulation, raises the blood pressure & increases the risk of auto-intoxication.

On account of the diminished digestive powers partially predigested foods may be made use of occasionally, e.g. Benger's food - Valentini's Extract of meat & Brand's Essence of Beef I have also found useful, the bulk required at a time being small.

Sleeplessness is often complained of by the aged though doubtless the degree of it is usually exaggerated - as a rule sleep occurs in the early part of the night but the patient awakens early & tosses about after that - a lady patient of mine aged 86 yrs constantly tells me that she has not closed her eyes all night, or for a week or more; as a matter of fact I have often on such occasions wakened her by my entrance into the room. The question of sleep can usually be best gauged by the appearance of the patient, the rested look of her eyes or the urine. Sir Geo. Humphry¹ found that only 9 per cent. of persons between 80 & 100 were classed as bad sleepers, 64 good and 27 moderately good - the average period of sleep was $7\frac{3}{4}$ hours, but we should order ten hours at least in bed, the quiet rest & warmth being of assistance, while the recovery of the aged tissues after exhaustion is slower than in the young. In many cases of sleeplessness all that is required is to provide that some light

¹ Humphry. old age. p. 46.

refreshment be taken in the night, sleep often quickly following on the meal. Where this fails bathing the feet & legs in warm water at bed-time, or gentle massage & passive movements of limbs may be tried - in other cases more especially those of nervous irritability I have found gentle massage of the face & forehead beneficial. Very often cold feet are at the root of the trouble when the application of artificial warmth & wearing of bed stockings relieve the condition - Rheumatic pains are often stated to be the cause.

Mental excitement in the evening affects different persons in different ways - as a rule a quiet passive evening induces sleep more than an exciting one, but I know one old gentleman who cannot sleep without a game of whist in the evening, another necessary condition being that he should win his game - arrangements are usually made accordingly. I avoid medicinal treatment as far as possible in these cases of insomnia but when simpler methods of treatment fail, drug treatment for a short time often allows the patient to regain the habit of sleeping.

The gradual decline in the mental & physical faculties deprives the aged of many occupations

and calls for entertainment from the friends in the form of reading aloud, conversation, games, to stimulate the receiving faculties, mental exercise to the brain being most beneficial so long as it is short of exhaustion. I have a patient, a retired schoolmistress aged 79 yrs, who finds she cannot read so continuously as formerly although she is still a wonderfully good conversationalist - being often alone she found time hang heavily on her hands until she began to play the game of "Patience" which has since whiled away many a long hour.

From the failure in eyesight & hearing old people are more exposed to accidents in every day life & extra care must be taken to guard against such seemingly trivial matters as stairs & anything that may be tripped over - as pointed out above, the bones become peculiarly liable to fracture & may lead to long confinement in bed with its risks of bed-sores & possibly fatal hypostatic pulmonary congestion.

Medicinal Treatment of the Aged.

We must remember especially in using powerful drugs that absorption & reaction are delayed in the aged, hence must not repeat strong doses too frequently.

Of all drugs perhaps the Vaso-dilators, iodides & nitrites, are the most useful - The Iodide of Potassium is however rather depressing & should be used with caution - it is best prescribed with ammonia & a bitter infusion.

In the restlessness so often noticed both by day & night I have twice got marked benefit from the use of Nitro-glycerin 100 gr in tablet as recommended by Dr. Clement Dukes!

Of narcotics the safest are the Bromides - next to them I would place Sulphonal - Paraldehyd is useful but gives the breath a most disagreeable smell for a day after. Chloral is too depressing to be used for routine use.

Diuretics have little effect on the skin & are to be replaced rather by Diuretics.

Of Tonics Quinine, Strychnine & the bitter Infusions are the most useful.

Purgatives should not be given in too powerful doses as great depression sometimes follows -

1 Clement Dukes - Restlessness of Old Age. "Brit. Med. Journal" Dec. 2. 1899.

Colocynthis & Calomel are useful for speedy action & do not cause excessive exhaustion. Pulv. Jalapa & Co. is useful to produce a watery motion with the idea of reducing collections of serous fluid.

Digitalis is one of the most useful drugs we possess, its effect on the heart being more lasting than that of Strophantus, but to produce speedy effect Strophantus is better.

Pepsin & Pancreatic Fluid are useful to aid digestion.

Dr. Brown-Séquard¹ introduced the subcutaneous injection of a watery extract of testis of adult guinea-pig, the extract being filtered through a Pasteur filter - 1 milligram was injected daily. He first experimented on himself with marked benefit, the fatigue & other symptoms common in old age disappearing for a time. This treatment has since been tried by other men & is recommended by many.

Althaus² suggested the use of the constant galvanic current to the brain, especially the vaso-motor centre in the bulb - he claimed that the treatment retarded arterio-sclerosis & the involution of the central nervous system, the patient after a week or two looking 5 or 10 years younger. Althaus pointed out that the treatment must be "faultlessly applied,"

¹ Brown-Séquard - *Lancet*, July 20th, 1889.

² Althaus - "Old Age & Rejuvenescence." *Lancet*, Jan. 21, 1899.

and few other men if any have acquired this skill.
