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The following thesis was composed, written, and also typewritten, wholly by myself.

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ALCOHOL & MODERN LIFE.
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Alcohol and Modern Life.

In offering as thesis this monograph upon the consideration of Alcohol as it affects human life in our times, the writer was influenced in his choice of subject by a very pressing personal desire to ascertain what, amongst the masses of material available, is to be regarded as mere hypothesis, and what, if in truth such exist, may be considered to be established as fact. On the basis thus obtained he then proposed to deduce the logical treatment of alcoholism, the existence of which no matter how caused is one of the unquestionable features of this as well as by-gone ages. But, involved and difficult as the matter already was through the disagreement of various authorities as to the very effects of alcohol itself on the body, the question has now become still more complicated by the intervention of Mr. Archdall Reid who claims that the only possible way of viewing alcohol is as a factor of stringent selection, against which certain power of antagonism or immunity has been evolved and which power must not be allowed to lapse. Concerned with this theory is the whole subject of not merely immunity, but that of the transmission or the reverse, of acquirements. And upon the atti-
tude assumed regarding the latter problem will largely depend on the possibility of agreement with the conclusions come to and the suggestions made in this paper.

The method of attack proposed is to examine first of all the constitution of the various beverages which owe their sale to the alcohol contained in them, and then to take up the consideration of the action of these upon the ordinary individual. In this the difficulties will be found somewhat unexpectedly great, but if a working compromise can be arrived at, a path will thus be cleared for the discussion of toxic or damaging quantities and results as generally accepted, though here also recent scientific dicta and investigation have rather clouded the issues. Pathological, if not sequelae at least almost invariable accompaniments of over-indulgence will require a word, and the clearly defined effects of alcohol on neuropaths of all kinds must be stated. It will be necessary to debate the direct action of alcohol on material protoplasm, including its effect so far as we are permitted to observe and deduce this, on such undifferentiated entities as germ cells, and at this point will begin our crucially important research in the matter of the actual deterioration produced in these relatively simple bodies, and the transmission of such deterioration to descendants: which means, of course
the reviewing of the whole fiercely-contested question of the effect, if such exist, of alcohol in causing degeneration. Here again, if a definite conclusion cannot be accepted, some compromise must be arranged, for lacking a justifiably firm hypothesis or working theory no valid remedy for the root-evil can be expected, and criticism would be merely destructive instead of serving, as it always should, as a preparation for a constructive scheme. Before any constructive exposition, however, the ground will be cleared by a short resume of what has already been done in the direction of prophylaxis and cure, and it is hoped that following this preparation, a conclusion will be come to, which if it cannot in any way claim originality, may at least lay claim to being a logical outcome from the argument, and which will, more-over, state a definite conclusion and belief.
Before proceeding to the discussion of actions and effects it is desirable that alcohol itself, as used in every-day life, should be defined. And this in any of the numerous liquors sold as wine, spirits, beer or liqueurs, differs very considerably from that commodity as known to medicine. Alcohol proper, or Ethyl Alcohol is certainly a constituent of all the exciseable fluids, but in very varying proportions and with equally varying accompaniments; some of these latter being themselves distinctly deleterious and capable of producing definite bodily disabilities.

For the facts concerning the different alcoholic beverages the writer is chiefly indebted to the excellent work on "Food and the Principles of Dietetics" by Robert Hutchison, and though the actual proportion of alcohol does not always agree with that stated by other authorities to exist in the various liquids named, still on account of the different standards and dilutions in different localities and countries it is impossible on this point to obtain or to expect perfect harmony, and the figures given by Hutchison may be accepted as indicating a fair average. The commercial article that approaches most nearly to the conception of a diluted ethylic alcohol is that which has for basis the product of the "patent" as distinguished from the "pot" still. In that patent still a grain spirit is manufactured from a mixture of barley, rye and maize.
maize with a small quantity of malt. It is distilled by steam, the ethyl alcohol alone being selected of that which comes over. This alcohol, almost entirely free from bye-products gives no indications of its origin, and is accordingly termed "Silent Spirit", and silent spirit by suitable flavouring may be made to imitate any of the more valuable or popular beverages of the moment, whether "Scotch" whisky, "Irish" whisky, "Brandy" or any one of the numerous liqueurs. It is also stated to be the basis of the "trade gin" which has so unenviable a notoriety on the coast of Africa and elsewhere. This matter of the comparative purity of patent still whisky is extremely important since a common impurity in alcohols otherwise produced is "Fusel Oil" which by some in fact most is considered to be Amyl alcohol though Hutchison defines it as a mixture of Propyl Amyl and Butyl alcohols; and amyl alcohol is believed to possess some six times the toxic powers of ethyl. The "patent" spirit alters little with age, requires therefore a shorter time to mature, and as a matter of fact is quite suitable for consumption very early after manufacture. Parallel, however, with this lack of necessity to mature runs the accompanying feature that it is less palatable than a spirit which on keeping tends to develop various ethereal bodies, such a spirit for instance as "Pot-still Whisky". And in regard to this point a recent action at law has
has decided that Scotch Whisky must be manufactured from grain in a Pot-still and contain not less than 380 parts of impurities for this is what they amount to, per hundred thousand.

Pot-still whisky must be made from malted barley, dried over peat in the case of the Scottish article to impart the distinctive flavour: it is then fermented with water, and this fermented "mash" afterwards distilled by the direct application of heat from an open flame. The volatile products, containing much bye-product are condensed in a "worm" and by several re-distillations "clean" spirit or "whisky" is obtained, among the bye-products being furfurol from partially charred sugar due to the process, and fusel oil in some quantity. It is the bye-products which give this whisky its harsh taste when young, but on the other hand it is the changes in these after several years in cask that cause the "mellowness" of the whole spirit and which is lacking in the patent spirit.

However obtained these spiritual bases of "whisky" are diluted to eleven or twelve degrees over proof, "proof" being the point at which the diluted fluid allow to will burn steadily after greatest dilution, some gunpowder soaked in the mixture, this proof spirit being found to approximate to a strength of 49 per cent of alcohol by weight or 57 by volume. The eleven over proof spirit, meaning that 100 volumes of it contain
as much alcohol as 111 of proof spirit, are finally stored in old sherry-casks; from this storage being obtained the requisite yellow colour. It is worth noting that whereas the common belief as voiced for example in Allbutt's System of Medicine is that "amyl alcohol tends to disappear in the process of mellowing", this is most definitely and categorically contradicted by Hutchison who maintains that none, or exceedingly little of the amyl, is converted though the total amount of spirit diminishes by about 6 per cent in five years.

Irish whisky though differing in flavour, resembles closely the Scotch pot-still product, and is got from malted barley and unmalted grain, the malt not being dried over peat. Potheen distilled from treacle resembles rum.

Brandy, of which there is only one genuine liqueur, viz. Fine Champagne, is practically a distillation from grape wine, and bears the same relation to wine as whisky does to beer. The great value of the best brandy depends upon the development of volatile ethers and aldehydes, and these increase in proportion with the years of storage, so that the oldest brandy is the most valuable. Little of the genuine article is seen in this country, the bulk of the so-called brandy being made by mixing silent spirit from the patent still with burnt sugar and various volatile oils.
Rum ought to be a product of sugar-cane juice fermentation, but is usually distilled from fermented molasses and frequently imitated by mixtures of silent spirit flavoured with ethyl butyrate to which is said to be due the distinctive taste of rum.

Gin, if genuine, comes from fermented rye and malt with the addition of juniper berries, salt &c. Is often, however, derived from turpentine and the usual silent spirit.

The approximate strength of alcohol by volume in rum, whisky and brandy, as these are placed on the market is 43 per cent, and of gin 37 per cent.

The various liqueurs consist of strong sweetened solutions of alcohol, flavoured with different essences the futile secrets of which are often religiously preserved. The volatile oils used, being themselves sometimes powerfully toxic, especially that from an Alpine worm-wood which is used in the manufacture of absinthe, and which is a convulsant poison.

Beer differs very greatly in composition in different parts of the country, the strong Burton ales containing from 5 to 10 per cent of alcohol, but the generic name is given to the liquids obtained by fermenting hops and malt. The important differences between it and whisky consist in its much smaller proportion of alcohol, the greater quantities of contained solids or food materials, the presence of bitter principles from the hops and also of carbonic acid.
acid. Spirits are all practically sugarless, a fact worth mentioning in connection with diabetes, and free from acidity, the worst in this respect being brandy the acidity of which equals one grain of tarteric acid to the ounce; and the total amount of solids is less than 1%. Beer brewed from malt and hops will contain from 16 to 23 pounds of solids in 36 gallons depending upon the variety, these solids being principally sugars and dextrins.

Substitutes for beer are made by using invert sugar, glucose from potatoes etc. on account of the expensiveness of the correct method of getting the sugar, i.e. from malt.

Porter or Stout is produced from malt in the same fashion as is beer, except that the malt is first roasted in order to produce caramel and thus derive the necessary darkness of tint.

The great difference in English and German malt liquors is due to the fact that the German processes of fermentation are carried on at a lower temperature so that more dextrins are present, while less alcohol is developed.

In a pint of good English bottled beer there is one fluid ounce of alcohol; one to two ounces of extractives, 25 grains of free acid and 13 grains of salts, and it is calculated that in this quantity there is as much carbohydrate as in an ounce and a fifth of bread. Stout contains twice as much acid
as beer. The comparison of the value of beer and milk as regards calories is decidedly interesting, for in a half-pint glass of milk there is a yield of some 184 while from the same quantity of Allsopp's beer with 30 grms of solids and 36 c.c. of alcohol the yield will be 168 calories. It must be noted however, that this is outside estimation value, and by no means represents the comparative values of these fluids when burnt up in the body.

Wines are beverages produced from the pure juice of the grape, though additions are sometimes legitimately made for the purpose of increasing durability. And wines differ not only according to the kinds of albuminous matters and sugars in the juice, but also in some measure to their being produced by different kinds of yeasts, these not being the same as produce the fermentations of beers and spirits. Each wine apparently possesses its own distinctive yeast.

It is not possible to enter fully into the composition of wines. Suffice it to say that they are extremely complicated bodies, much more so indeed than the other liquids already described. They all contain ethyl and other alcohols, malic, tannic and tartaric acid, sugars, oils, ethers, aldehydes, albuminous matters etc. The amount of acidity is important and it is to be noted that sweetness is no criterion of lack of this acidity. The highest proportion of ethers found by Dupré was only one in 300.
The alcoholic content varies with the wine but in the case of the port wines supplied to this country which are all "fortified" for preservative purposes, it reaches as much as 15 to 20 per cent by weight.

The champagne drunk in England has mostly had brandy added to it to increase the alcoholic strength, but the natural wine contains about 10 per cent by weight.

Cider and perry are alcoholic to the extent of 3 to 8 per cent, thus resembling beer in strength.

Evidently then from the foregoing short account of the alcoholic fluids in common use, there should be taken into account in estimating their action on the human body much more than merely the ethyl alcohol contained in them. In brandy the volatile ethers must be noted: in wines the relatively great acidity: in liqueurs the powerful volatile oils: and in beers, on account of the quantities used by even so-called moderate drinkers, the large proportion of carbohydrates and solids imbibed as well as the bitter and sedative principles from the hops. But as this investigation deals principally with the effects produced in those who drink with the object of undergoing the mental changes induced by the alcohol contained in them, and not merely to satisfy thirst or delicate appreciations of flavour or taste it may be sufficient that, having indicated the
presence of these other constituents their actions may only be noted when these definitely complicate those unquestionably due to alcohol itself, or when morbid influences are clearly due to their presence alone.

Pure Ethyl Alcohol, the hydroxide of ethyl, is a colourless mobile liquid of Specific gravity .8. It is soluble in water in all proportions but on so mixing it gives out a slight amount of heat and the mixture contracts. It is volatile and a valuable solvent for alkaloids and volatile oils. In a strength of some 55 per cent and upwards is coagulative to albumin, precipitant to unorganised enzymes such as pepsin, ptyalin, and is naturally of some importance as an antiseptic. It is to be noted that the only strengths of alcohol in beverages necessary to produce these results, will exist approximately in the spirits and liqueurs when undiluted. The coagulum of protoplasm induced by such alcohol is however readily redissolved. On complete combustion one gram of alcohol represents a heat value of about 7 calories. It is readily diffusible and for animal membranes possesses an endosmotic equivalent of 4.13. The fact that it is readily oxidisable may be emphasised. From these properties are derived all those numerous actions in the human body which now fall to be considered.
The action on the skin may be disregarded, and the first consideration must be that of the action of alcohol when it comes into contact with the mucous membranes of the alimentary tract, including the mouth, pharynx, stomach and intestines. I may here note a fact that seems to be of some importance, viz. that probably very little alcohol passes lower than the duodenum or beginning of the small intestine, and that on account of absorption chiefly taking place higher up, the quantity that reaches the bowel will be exceedingly small; and consequently any effects in the bowel presumed to be occasioned by alcohol are more likely to be due to continuations of results effected earlier in the tract, or from reflex actions. The presence of alcohol on all these membranes will be similar in its production of results, save that as dilution increases with distance from the mouth, the effects of even "neat" spirits will only for a short time be observed in the mouth and pharynx, and for a still shorter in the stomach. The tendency will be for such strong solutions to cause an evanescent superficial coagulation, accompanied by a sense of heat or burning; this preliminary astringency being however rapidly followed by dilatation of those vessels in immediate contact, and an increased flow of the normal fluids of the parts. Mucus, ptyalin, pepsin etc. though in increased amount should therefore occur in ordinary relative proportion, and
for normal individuals and infrequent doses, this statement probably holds good. In dilution, no coagulation will occur, and the effects will be those of vaso-dilation and increased secretion, very rapidly reinforced by reflex and absorption conditions. These act in the direction of increasing or promoting the vessel dilatation, increasing the force of the heart's action, the output of secretion and the normal peristalsis of visceral muscle, while along with this goes a general expansion of arteriolar capacity and especially that of the vessels of the skin. In addition, as a local effect may be mentioned the production of some degree of anaesthesia. For single doses or small quantities it may perhaps be granted that no appreciable precipitation of enzymes occurs.

This is the simple statement of what actually does occur in such a case and regarding this the differences of opinion are practically nil: but the moment one begins to investigate the interpretation and the results of these effects, that moment sees the beginnings of those discrepancies which cause practically a modern battle of the books. It might, with some justice, be assumed that the total effect of such an action as described would be a decided, if temporary stimulation of digestion, and this ground is taken up by many authorities. Binz for instance is frequently quoted as having declared and proved that alcohol in 20 per cent strength in-
creases the rapidity of absorption of the gastric contents. Hammarsten in Physiologische Chemie 1895 pointed out that some observers claimed that the gastric juice after large doses of concentrated alcohol was alkaline in reaction, though small doses diluted caused a large quantity of normal secretion. In Kirke's Physiology it is stated that "within moderate limits alcohol is a stimulant and aid to digestion." Hale White in his Materia Medica declares "alcohol aids digestion...in small quantities. is very valuable for the indigestion of the aged and feeble or for those who are thoroughly exhausted by overwork." Ringer & Sainsbury say in their "therapeutics".."kept within moderate limits, the influence of alcohol on the functions of the stomach is that of a remedial agent." But Kraepelin in Munch. Med. Woch. Oct. 17th, 1899 "whoever knows the effects of alcohol will not class this substance among the harmless agents." Victor Horsley in the Lancet of May 5th, 1900 "Even small doses of alcohol at meals have a deleterious influence, and total abstinence must be the course of those who wish to follow the plain teaching of truth." R.C.Cabot in the Bost. Med. & Sur. Journal July 23rd 1903 says "in the stomach alcohol disturbs the digestive process to a greater or less degree; and on this side also is Metchnikoff who holds that alcohol in any form is a poison.

The case becomes no simpler when we leave this and pass to the effects produced reflexly and after
absorption of the alcohol, which passes into the blood unchanged thus requiring no primary digestion. The statement usually accepted is that a single dose of neat whisky, brandy or gin raises the total blood pressure by increasing the rate and force of the heart, though along with this goes a general vasodilation especially noticeable in the arterioles of the skin and that after absorption these effects are reinforced. On consulting "Allbutt's" article on Alcohol regarding this we find "In small quantities alcohol acts as a stimulant to the bodily functions generally and especially to the circulatory and nervous systems. For an average person the physiological amount is about one ounce of absolute alcohol." Cabot in the same article already quoted "The action of alcohol upon the circulation is NIL. Neither the maximum nor minimum blood-pressure showed any variation that could be reasonably attributed to the action of alcohol." An address given by Fraser to the Edin. Med. Chi. Society on July 3rd, 1901 may be quoted "Alcohol in small doses increases the force of the heart’s contraction and quickens its action...no subsequent depression following. As a result of cardiac increased action and muscular dilatation of vessels....a consequent stimulation of distant tissues of the body." In the Medical Annual of 1903 p.9 "Dr Hewes in Boston Med & Surg Journal holds, with Schmiedeberg, against the preliminary stimulation
followed by depression believed in by Binz, that alcohol is a depressant from the beginning."

Nor is there greater unanimity when the alcohol is traced onwards into the blood and the effect of its presence there discussed. It appears to be generally admitted that alcohol resembles in its action on the red blood corpuscles, that of prussic acid and quinine in tending to prevent the haemoglobin from parting readily with its oxygen, and further that the alcohol is oxidised in the blood and tissues to form water carbonic acid etc. and thus ought to be a source of energy to the organism. As a result of the lessened oxidation which I may perhaps suggest could be accounted for by a slight coagulative effect on the red cells, metabolic changes would naturally be expected to diminish, food combustion to lessen, temperature to fall and an accumulation of unoxidised products to occur in the tissues. The lessened food combustion should be aided by alcohol itself being oxidised, though the energy set free by such oxidation would to some extent, the falling temp. though this fall would be contributed to by the increased radiation from dilated superficial vessels, and by greater perspiration. The lessened metabolism of body products is evidenced after moderate doses of alcohol by a diminution of from 6 to 7 per cent in the urea and uric acid and accompanying this a lessened excretion of phosphates and sulphates.
The preceding statement would seem to follow fairly naturally from what are usually admitted to be the facts, and in favour of this view may be mentioned the names of Ringer & Sainsbury, Fraser, Binz, Richardson, while holding definitely opposed views are Cabot, Parkes & Wollowicz &c. The experiments of these latter may be referred to in some detail, since they are so numerously quoted. A healthy young man was given from one to eight ounces of absolute alcohol daily for six days, and subsequently twelve ounces of brandy daily for three days, the temperature being taken every two hours. The average temperature on these various days was found to be practically identical with that on days when water only was drunk. Parkes has since re-investigated this subject and finds that alcohol even four to eight ounces absolute if given with food will produce no depression of temperature. This experimenter also denies that alcohol lessens the amount of nitrogen disintegration, and in agreement with this there is a considerable weight of authority. Hutchison says alcohol is probably not a proteid-sparer and "it is burnt up in the body sparing fat and carbohydrate." In fact if, in connection with this subject, there is one point on which modern opinion seems likely to become harmonious, it is on this question of the kind of material that is spared in the body, and the statement of Hutchison may be held to embody the latest belief.
On the fact that alcohol is actually burnt up in the body it may be assumed that the various authorities are agreed though even on this contrary ideas have to be noted, for instance Perrin, Duroy and Lallemand denying that alcohol is consumed in the smallest degree in the body. The last, however, I propose to ignore and shall rather accept the authority of investigators like Atwater and Benedict. The conclusions come to by them is found in the Memoirs Nat. Acad. of Science vol. 8, 1902. They used 2½ oz. absol. alcohol daily in the form of commercial alcohol, brandy and whisky. This quantity equals a bottle of claret, six ounces of whisky or five ounces of brandy. Three healthy young men, two of them abstainers were placed in the chamber of a respiration calorimeter for 4 to 9 days. 1.9 per cent of the whole alcohol was eliminated by the lung, skin and kidneys. Taken in small divided doses equal to a glass of wine each 1 gm. of alcohol was found to be isodynamic with 1.73 of carbohydrate or .78 of fat. They found no appreciable effect on the absorption of ordinary food. Alcohol potential energy was transformed in the body into kinetic as completely as ordinary nutrients. Radiation was very slightly greater than without alcohol. In the "resting" experiments the energy of the alcohol was transformed into heat. The body fat was found to be protected, but proteid was not.
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A very important feature of the Atwater investigation lies in its bearing on the point of whether and if so to what extent, alcohol may be looked on as a true food. Atwater himself says that from a seventh to a fifth of the total diet can be replaced by alcohol. But Sims Woodhead in the Edinburgh Medical Journal of Aug. 1901 finds that "its food value under ordinary conditions is practically nil, and put in the most advantageous light can only be temporary, and then of an extraordinary slight and wasteful character." Hewes in the article previously referred to says "and that even though in one sense it may be considered a food, its effects are so deleterious that the evil outbalances any effect for good, not only in health but in disease." Fraser says "its only value (as a food substance) lay in allowing us to tide over an emergency." In an Editorial in the British Medical Journal of March 14, 1903 a number of interesting opinions are collated:—Duclaux will agree to a truce accepting as an average one litre of wine a day. Berthelot is clear that alcohol is not a food. Brouardel states that from the chemical constitution of a body no conclusion can be drawn as to its alimentary value. Charles Richet says there is no doubt that alcohol is a food, and that in very small doses when pure it is almost harmless. Magnan thinks that whatever chemistry or experimental physiology may appear to show, alcohol can
never be recommended as a food. The weight of opinion then among the scientific men of France appears to be in favour of the dietetic value of wine and the Editor of the B.M.J. sums with the quotation that is perhaps justly applicable that "one man's meat is another man's poison."

Though it is somewhat difficult to adopt a satisfactory order of arrangement in considering the effects produced by alcohol perhaps at this point may also be considered the influence of this drug on the sepsis-resisting powers of the individual, since most likely these depend upon alterations induced in the leucocytes bathed by blood and other body fluids containing the alcohol. It is generally believed that at any rate excessive drinking lowers the resistance to tubercle bacilli, pneumo-cocci and other organisms, but how far this is due to depressed temperature in spite of a protection by antiseptic alcohol, or to an actual depression of the vitality of tissues by the alcohol itself, I am not competent to judge and shall merely write down the views of the observers, at the same time remembering that simple chill is sufficient frequently for the onset of various diseases and especially those mentioned. In the article on "Alcoholic Poisoning" in Gibson's Text-book of Medicine much stress is laid on the experiments of Abbott with rabbits. It is to be noticed that large doses of alcohol were given to these rabbits for several days, and they were then inoculated
ated, some with Streptococcus pyogenes and others with the Bacillus Coli. It was proved that "instead of fairly large doses of alcohol increasing the vital resistance to infectious disease, such tend not only to lower this resistance, but to increase the severity of the illness when caught." It is further stated (p. 603) that alcohol "frequently precipitated the individual into active tuberculous disease.... under the debilitating influence of alcohol vital resistance is reduced." Hare, however, in the Therapeutic Gazette of May 1903 in attempting to reconcile the pharmacological, which is one of depression, and the clinical view of alcohol, showed that the use of alcohol for several days increased the bacterioclytic power of the blood serum against the bacillus coli to an extraordinary extent with half-ounces doses of alcohol every four hours for six days. And Mircolo & Gervino (Gaz. deg. Osped., 44, 1903) find that the blood of alcoholics can neutralise tubercle toxins, so long as the alcoholism has not reached the stage of destruction of the tissues. Similarly with animals. There is a diminution in the coagulating power of the blood and an increase of haemolysis. While regarding this the statement of Fraser in his address to the Edinburgh society is of supreme importance: Professor Fraser instanced the incidence of Plague amongst an absolutely teetotal population as giving a case mortality of 95 per cent,
whilst among alcohol-drinking Europeans it was 20 per cent, and stated that similar results were seen in the recent outbreak of plague in Glasgow.

It may perhaps be suggestive to note that the demoralising effect of the alcohol upon the vital centres and resources of the rabbits in Abbott's experiments was greater than the toxic effects of alcohol on the cocci and bacilli, since by all analogy such toxic effects undoubtedly exist. And in this matter of strepto-cocci and alcohol it is interesting to observe that G. Fisher in La Presse Medicale of July 7th, 1900 states that a dilution of alcohol of 55 to 100 is toxic to these.

To come now to what has previously in part been considered, the effect of alcohol upon the circulatory system, since here must be noted the results of alcohol circulating in the blood upon the heart and blood-vessels. The admission is general, despite of course the inevitable disagreements, that an early feature after administration of any ordinary quantity is a preliminary rise in the blood pressure. The address given by Russell on Angina to the Edin. Med. Chi. Society on Dec. 6th, 1905 bears on this question of blood-pressure. He states that after taking food and for at least part of the time during active digestion there is hyperaemia of the splanchnic area balanced in the general circulation by a
systemic arterial contraction, which is evidently a reflex phenomenon from the vaso-motor centre in the medulla, and which holds on the authority of Dr. George Oliver for the ordinary healthy person...

"in the wine-drinker the arterial contraction is associated with a rise of blood pressure and a true increase of arterial tension." "Granting the existence of this normal reflex it will not be questioned that.....alcoholic liquors accentuate it. Two elements present. the vascular reflex....and. the passage into the circulation.......of substances derived from the alcoholic liquors. It is not at present possible to give these two factors their precise place."

We have already seen that the interpretation of the increased circulatory activity assumed to occur varies greatly. On one basis the reaction is stated to be that of the heart to what is essentially poisonous, on another that there is a genuine preliminary stimulation but that this is succeeded by a neutralising depression; and on a third that there is a valuable stimulant action with no depression if the dose is carefully graduated. Ringer indeed says:--

"alcohol strengthens the pulse and must be considered as one of the most powerful cardiac tonics we possess." (Therapeutics, p.360). Here, however, we begin to pass from the physiological discussion to that of clinical experience and it may at once be
stated the clinical opinions are nearly united in their agreement that for picked cases alcohol has its uses as a valuable tonic, stimulant and food.

But it is necessary to proceed a little further with effects on the ordinary body in a state of health so far as regards muscular and general visceral activities. And here again there is a general consensus of opinions, so far at least as prolonged and severe muscular work is concerned. For wherever endurance is a necessity as in war, arctic or antarctic explorations, or those sports which require a methodic course of training, alcohol has been universally abandoned as an assistance towards efficiency. Allbutt summarises the facts in "it may enable a man to spurt but not to stay" and states the quantity that may be looked on as safe "for an average person the physiological amount is about one ounce of absolute alcohol". In the same article on "Alcohol" Parkes and Wollowicz find that one and a half ounces was the physiological amount but although this result was true for "two strong healthy men accustomed to alcohol in moderation" it is safer to take a lower standard for the average town inhabitant. "There is no doubt that healthy young people are better without."

It is to be understood that the results are to be qualified with the conditions that the alcohol is to be administered in divided doses well-diluted
and the quantity spread over a whole day. The effects too, on the nervous system begin to complicate matters; for sensations of well-being and ease induced by these tend to make estimates of work done under the influence of alcohol decidedly fallacious. This has been proved over and over again in the many psycho-physical laboratories of especially Germany and the average result of such experiments may be summed up as proving that the cold timing of the clock does not confirm one's own estimate of the speed and accuracy of work so performed. A few excerpts from the article on Alcohol in Sajou's Analytical Cyclopaedia of Practical Medicine may be adduced. P. 187. "One ounce of alcohol greatly reduced the perception. (Ach)." "Capacity for calculating lessened, but while alcohol lessened the ability to reckon accurately, the work was easier. (Vogt)." "The capacity for physical work increased about one third after the ingestion of alcohol, but in ten minutes this increase had almost entirely disappeared. It did not really increase the strength. When alcohol is added to the fatigue products of the muscles the depressing effect becomes very marked. Rest after taking alcohol prevents any noticeable diminution of strength, but if the action demands the utilisation of strength fatigue rapidly comes on. (Gluck)."

The nervous conditions cannot be dissociated
altogether from those concerned in working ability, and though the evidence as regards muscular work is pretty conclusive, the matter is by no means so simple when more purely intellectual efforts are concerned. Thackeray for instance stated that his best thoughts came to him "when driving home after dining, with a full belly-full of wine." and Disraeli and Gladstone found that alcohol helped them when extraordinary oratorical efforts had to be made, and that without it the effort was more laborious and less successful. The cerebral effects certainly ensue very rapidly after any alcoholic drink is taken, and it is even stated that there is a definite affinity between alcohol and brain tissues. It is noteworthy that alcohol in its development from saccharine materials by the action of yeast undoubtedly resembles in its production that of numerous toxins and it is perhaps permissible to regard it as "the toxin of the yeast plant". And we have examples of other toxins being selective of those parts of the organism on which their most potent influence is exerted as with diphtheria, tetanus &c. which select nerve matter, or like the alkaloids as strychnine which chooses spinal nerve cells. But there is a fallacy in connection with thus regarding alcohol, which it seems to me has not been previously stated. For although it is quite possible that alcohol may be found in the brain and cerebro-spinal fluid when it is not discov-
erable elsewhere this may be due to a mere effect of gravity on account of the lightness of alcohol, or in the case of the cerebro-spinal fluid to the fact that in this fluid very little metabolic action can proceed. Affinity or not, however, the cerebral results are those principally aimed at by all consumers of alcohol for the sake of an anaesthesia induced in not only ordinary afferent nerves, but especially in those latest developed centres which deal with morality and judgment.

Naturally, in this realm also there is the usual divergence of beliefs as to what actually does occur, but one advantage of this inevitable disagreement, though perhaps a dubious one, is that anyone fairly well acquainted with the conditions appears to be quite as competent to theorise upon these as the most highly trained of psychical or physiological experts. So that having as a student, had considerable opportunity of studying its results at first-hand, and since then in general practice of observing the effect of alcohol upon others, I have the less diffidence in submitting my own conclusions. And first upon the possibility of there being an actual stimulation of the cerebral faculties. And to premise, the Law of Dissolution which says that faculties tend to be toxically affected in the inverse order of their appearance, will be accepted as basis, with the necessary corollary that any general cerebral stimulant
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will also operate in a similar sequence. For the sake of argument the statement will be accepted that, at any rate in large doses, alcohol a protoplasmic depressant, is also depressant to brain tissues and energising, but it is usually agreed that whether depressant from the beginning or not the first effect noticeable is akin to stimulation, since the effects of a genuine stimulation and the results of a mere reaction against a danger are practically the same. Whichever view be accepted then, that of a reaction against or a de facto stimulation the first results will be indistinguishable and will appear as increased energising. Further in the majority of ordinary individuals quantities of alcohol increase the blood supply to the brain sometimes by dilatation of cerebral vessels, sometimes by a raised blood pressure and frequently by both. In addition by copious blood supply to the skin which means that a great proportionate bulk of the alcohol imbibed will be found surrounding nerve terminals, the feeling of bodily comfort thus induced combined with slight depression of sensory terminals, irritating afferents are largely cut off and the cortex freed to a large extent from the "pin-pricks" of daily surroundings and life, is at liberty to attend more to intra-cerebral affairs and thus disposed to the opening up of wide association areas. Such increase in the perception of associations is, within limits, decidedly desir-
able for, in this respect, may be found the differences existing between mediocrity, talent and genius, since the last is after all merely the supreme manifestation of an ability to perceive relations between facts no matter how widely dissociated in time or space. This coupling-up of association orders or areas of the same degree or kind would lead to no failure in judgment though imagination would be increased. But a further levelling of barriers dividing areas of different order while still further increasing imagination would result in quaintness, bizarreness and grotesqueness in which the psychical groupings would be at the mercy of an actually established physical inter-connection. It is in this overflow of stimulus from its legitimate channels, that it seems to me the cortical actions of alcohol may be understood. There are people in whom the splanchnic area vascular dilatation referred to by Russell is preponderant and in these there may actually exist a cortical arterial contraction necessary to assist in the general systemic compensation, and in these one would expect what is perceived, viz. a lethargy or torpor amounting to actual sleepiness after taking alcohol and accounted for on this hypothesis by brain anaemia. Or again in those of a somewhat neuropathic or extremely sensitive nervous type the chief effects of any brain alteration would depend upon the particular weakness, and would not
follow any orderly cortical sequence. What is described here deals only with what may be surmised to follow the administration of restricted amounts, but it may not be out of place to follow on to the consideration of what occurs in drunkenness or the intoxication produced by amounts excessive in the case of any special individual.

The usual path then is what we shall agree to call a stimulation of imagination with possibly some increase of the power of judgment; next hyper-imaginative processes with bewilderment of the judging faculty; then in due course the higher inhibitions setting free the powers of laughter, muscular movement, speech, singing, weeping and so forth so that at almost the one moment any of these may be indulged in, evidencing usually ludicrous attempts to lead a rather curious "complete life". If the poisoning be persisted in, the bewilderment of judgment will be succeeded by actual depression and paralysis, followed by paresis of imagination, then of motor powers, and along with progressing sensory anaesthesia depression of the medullary centres controlling the respiration, heart and blood-vessels. till life itself will be endangered. And to complete the sequence, and remembering that however careless of the single life, nature is ever careful of the type, it should now be noted that if merely on logical grounds, it is probably not till this point of intoxication is
attained that the actual germ-plasm destined for perpetuation is itself menaced. A fact of the greatest importance in connection with the discussion of alcohol as it can affect degeneration, which it need hardly be stated depends upon the possibilities of altering this plasm.

Having now traced alcohol from its ingress to the mouth through the stomach into the blood to its effect upon the nervous stem, a word only need be said regarding its elimination, since its effect upon the viscera in small quantities or physiological amounts is negligible. And in such "physiological" quantity the vast bulk, probably anything over 97 per cent is excreted by the skin in the form of water and carbonic acid and by the lungs; the small remainder in the shape of unchanged alcohol being disposed of by the kidneys to which in such dilution it can do little harm. On blood-vessels themselves in such passage through the body it is hard to see that single or infrequent imbibitions can produce any notable effects.

In case what has been stated regarding cerebral effects may be regarded as being based upon too rash an assumption concerning stimulation, I should like to say that in "Allbutt" the statement is made that "Imagination and thought are stimulated."

Having then, however incompletely and with whatever revelations of irreconcilable beliefs and dec-
larations on practically every salient point, treated of the actions of what had best be termed "non-toxic" doses, the argument has now to bear on the admittedly deleterious influences exerted by alcohol in the human body.

In the alimentary tract, abuse leads to results which vary only with the part of the canal attacked. In the mouth pharynx and stomach where undoubtedly there is continuous and direct contact of the alcohol the preliminary astringency and attempts at coagulation lead to irritation and persistent hyperaemia, ending in deterioration of the more valuable secreting tissues concerned with the elaboration of the different ferments, and proliferation of the connective. Resulting finally then in thickened rugose membranes englotted with inspissated mucus, containing more or less atrophied special glands or cysts derived from the obliteration of these, with in addition the pigment derived from minor haemorrhages. Accompanying these changes are the natural results on bodily functions which may be summed up as "dyspepsia" and which mean that bacteria, sarcinae &c will reach as high as the stomach, not being antagonised by the normal secretion of hydrochloric acid, trypsin etc.

The point is to be noted that there is definite change in the tissues induced by the direct action of the alcohol, as well as those changes which are due to secondary actions made possible by the alcohol.
And it is in this respect that alcohol as a deleterious agent is of such importance, for if as in the case of opium or tobacco no actual bodily alterations occurred the question of remedy and almost complete remedy would be settled by mere abstinence. Where however actual degeneration of tissues has occurred it is evident that restitution of original conditions is beyond hoping for.

The wines containing as they do large quantities of acid have naturally an additional potency in causing indigestion unless used at that stage of digestion when the alkaline ferments of the mouth and stomach have ceased to be active. Wine immediately before food then is bound to be harmful in greater degree than simply alcohol.

In excessive quantities part may reach the intestines but, as a rule, very little does and this is evidenced by the fact that the pathological changes in the intestines of drunkards are comparatively slight, the bulk having been absorbed before arriving there. This seems to me of considerable importance, for it means that while the other tissues of the body including the protective leucocytes are being bathed in a depressing fluid, the various organisms of the intestines are left to a corresponding extent unantagonised, and will proliferate and exert harmful influence accordingly. Here, we have an explanation of why it is that the individual whose primae
viae are thoroughly evacuated once or even twice daily suffers much less from alcoholism though imbibing the same quantity, than the one in whom excess leads to constipation. For in the proliferation of the numerous intestinal bacteria is believed by many to be the cause of numerous affections which have hitherto been loosely included under the effects of alcohol. The wonder is that with the train of consequences following alcoholic abuse persisted in often for many years, that there are any individuals with bowels so naturally protected that little or no harm seems to result in them. For there must occur defective insalivation and fermentative processes in the stomach to some extent, with a direct extension onward of the catarrh reinforced by the arrival of the unhealthy stomach products and undigested food with the normal result that the stimulus to the pancreas from the duodenum will be weakened, and the trypsin which, I believe Virchow and perhaps Beard and others, claim to be an essential bacterial antagonist, must deteriorate. Not astonishing therefore to find that serious bowel mischief results, but rather that it should ever fail to result.

When intestinal trouble does ensue, the ducts leading from the duodenum to the pancreas and liver are so invitingly easy of access that as a natural corollary, liver and other affections might be expected. And so it is that there is now considerable
discussion regarding the etiology, for instance of cirrhosis of the liver, which has been long regarded as a typical alcoholic lesion. Hale White, in the B.M.J. of Mar 7th, 1903 however, denies that the common form of cirrhosis of the liver is attributable to anything else than the abuse of alcoholic drinks. But Gilbert in La Presse Medicale of Oct. 21st 1905 claims that among the direct results of the toxicity of bacterial residents of the intestine must be included biliary lithiasis and sclerosis. While in addition he attributes to this cause, appendicitis, cholaemia acute articular rheumatism and many other affections. In connection with insanity too, which in some of its manifestations suggests definitely an intestinal intoxication the excellent results obtained by Clouston and others in treating such cases by strict attention to proper evacuation are at least suggestive.

Steady soaking of the blood with alcohol should naturally lead to an accumulative depression of the cells contained, the vessels surrounding it, and the tissues nourished; and with the reserve that the immunity of the individual varies tremendously, this generalisation may be accepted. Metabolism is generally depressed, vessel walls, and parenchymatous tissues are weakened leading to the inevitable lower tissue proliferation; the heart is depressed and arterioles tend to become permanently dilated, as
in the skin. Where the dyspepsia is a predominant factor the drunkard will become thin, but where food absorption is fairly effective the tendency will be in the opposite direction and towards an accumulation of fat (which is the most difficult) unburnt up in the tissues. Such fatty accumulation will be naturally aggravated when beer with its large carbohydrate content is the liquid preferred. In spirit-drinkers would be expected to occur the emaciated cases, on account not only of the small solid constituent but also because the greater strength of alcohol is more active in causing alimentary trouble. As a result of the lowered metabolism and permanently dilated vessels leading to greater loss by radiation, one would expect that greater susceptibility to diseases that may originate in chills, and which actually does occur; despite the undoubted increase in the bactericlytic power of the blood of drunkards which was previously discussed.

On the heart and vessels, we have till recently believed that alcohol was a chief cause of arteriosclerosis, and fatty and other degenerations tending to aneurisms; apoplexies and hypertrophied and dilated heart; with, as a secondary result of the deficient oxidation of the tissues and the increase of fat everywhere especially in drinkers of beer and the saccharated wines, a fatty infiltration of the heart. And though part of this belief still holds, Dr Cabot says
"the alcoholic origin of arterio-sclerosis is a myth",
and Sir James Barr in an Address on Arterio-Sclerosis reported in the B.M.J. of Jan. 20th 1906 says "It has really got very little to do with it except in the production of gout: it leads to fatty changes in the muscle of the heart and in the middle coat of arteries.....there is not much thickening of the intima... teetotalers often suffer from sclerosis of the cerebral vessels." The opinion seems to be growing that excess in nitrogenous waste products is a prolific cause of not only gout but arterio-sclerosis, and the experiments of Chittenden should here be mentioned as having proved that the average man if eating on the lines laid down by various scientifically compiled and hitherto accepted food tables is taking in from two to three times the quantity of food that he ought. Allbutt quotes A. Garrod on the question of gout as saying "Neither the acid, sugar nor any known principle in alcoholic drinks can be shown to be the active factor in producing gout."

It is perhaps futile in the present state of knowledge to pursue this investigation into arterial effects further, since the essential point will be at once admitted that weakening of the vessel walls does occur in Alcoholics whether or not arterio-sclerosis be contributory to this. And it is sufficient to accept the degenerations that are accepted. But
I should like to state a consideration that has occurred to me:—strain is accepted as a cause of atheroma, though by this is connoted muscular exertion. But by incessant imbibition of alcohol and particularly if the liquid in which it is contained is a dilute solution necessitating the taking of huge quantities, the effect produced will be that of a persistent strain on the vessels in accommodating it and on the heart in responding to not merely the alcohol but the necessity of driving on the continual inflow. So that it would not be illogical to expect in steady drinkers that results of this strain, which is by no means a small amount, would be manifested. So far as beer-drinking goes I may instance a patient of my own, who every evening disposes of twelve bottles of Bass.

As typical of the authorities opposed to Barr, and among whom may be numbered most of the writers on insanity, it will be sufficient to quote from the article on Alcoholic Insanity in Berkley's "Mental Diseases" "unmistakable evidences of the secondary degenerative effects of the drug can be noted in the wide-spread arterio-sclerosis and atheroma of arteries."

And as a result of the weakening of arteries, however induced or explained, must follow a mal-nutrition of the bodily tissues generally, aided in most instances by the absorption of toxins from the
bowel. It may be assumed that the primary effect of excessive or continuous alcohol will be evidenced by a preliminary embarrassment of parenchymatous tissues everywhere, with the sequelae of cloudy swelling and later fatty degeneration, and these results would naturally affect chiefly or at least be most readily perceptible in liver and brain. In the liver on account of its importance in digestion and also its position of easy attack, and in the brain from the innumerableility of its investigators and the fact of the late development and delicate susceptibility of its cortical cells. And in these two organs in the later stages the ill-effects of alcoholism are indeed very evident. In the brain however, up till now the changes in the delicate cortical arteries have been most noticeable, though it seems likely that preceding these changes the delicate cortical cells have been first to suffer. Better methods of investigation and staining will probably soon determine this point but at present the earliest results are undoubtedly perceptible in the vessels. And the point is only noted for the sake of suggesting that theoretically parenchyma should be the earliest to be involved. In all organs, whatever the order of development, the changes are shown as a deterioration followed by an actual destruction and resolution of the master-cells of the tissue, accompanied by a proliferation of connective elements,
and degeneration of vessels. The changes in structure accounting readily for the observed alterations in function, it being again noted that where from inheritance there exists already a morbid susceptibility in certain cell areas to morbific influences, as in the case of epileptics and others impulsively unstable, those areas will inevitably be selected by alcohol, and the ordinary routine of symptoms be thus disarranged. In special cases nerve terminals appear to be particularly open to attack, and then a neuritis of the vagus or other nerves will result making the comparison with the toxins of diphtheria still more marked. The selective action of alcohol for brain cells has been adverted to previously Allbutt for example instancing Brunton as saying that he finds "the narcotics of the alcoholic series have an affinity for the substances of which the nerve centres are composed:" and Binz"Morphia, chloral, chloroform &c possess a strong affinity for the cerebral cortex."

Lest there should exist any curiosity as to why in some cases brain centres are attacked, and in others nerve terminals, in both of which be it observed, protective sheaths are lacking, it seems to me that there is a simple explanation from the varying behaviour of the vascular response in different persons. Where, from the great dilatation of peripheral arterioles, associated with comparative anaemia of the
cortex very little alcohol-containing fluid reaches the brain, the explanation is simple. And on another hypothesis where though there is great cerebral activity, the brain seems to suffer little, the fact that the alcohol is speedily oxidised seems to fulfil the indications.

Sufficient perhaps has been said to show how living tissues are affected, without going into the actual minutiae concerning any one organ, and what has been indicated of effects will hold also for the organs concerned in excretion, though some hypertrophy of the kidney might be postulated before any necessary deterioration, on account of mere functional stimulation. Still, though much has been brought forward to explain the actual deterioration that must take place in the individual, nothing has yet been advanced that would account for a similar deterioration in the off-spring unless also self-induced by direct experience of alcohol. For the possession of a deteriorated and sclerosed brain in the father, by no means decides a similar possibility in the child, since we do not now accept the wild suggestion of Darwin that inheritance of faculties or developments is determined by Pangenesis, in which it is assumed that the germ plasm receives contributions from every part of the progenitor. And it is essential now to discuss what effect, if any, all this
drinking will have in the way of materially altering the material set aside for reproduction. For only by such alteration can even the worst form of alcoholism be claimed to produce a definite alteration in the race. It will be as well to remind ourselves of the exact definition of terms that must be employed in this discussion, for by a misuse or misunderstanding of these can be explained dicta by men whose authority in other matters is unimpeachable, but who in dealing with the facts of heredity occupy a very similar and equally ludicrous position with that assumed by the late Lord Salisbury when he forgot that he was a politician and condescended to expound the doctrine of evolution, to the British Association.

First of all the position will be taken up that acquirements are not transmissible: and by "acquirements" is meant any power or property obtained after fertilisation of the ovum by the spermatozoon. In contra-distinction to this the term "Variation" will be used to designate any difference in the off-spring marking it off from the ancestry, and which has not been developed after fertilisation. The ordinary fact of "birth", meaning an emergence from utero, has no significance in either connection. The importance of these distinctions will be at once realised since evidently for alcohol to produce any racial effects it will be needful for it to alter germ-plasm.
Supporting the belief that there is a distinct inherited degradation, there is any amount of apparent evidence and authority. Allbutt says "Hereditary taint may be traced in a very large proportion of alcoholic cases. The children of drunkards are extremely susceptible to the influence of alcohol." and again "Dipsomania is the result of an hereditary taint."

Berkley in his "Mental Diseases" says "As a result of the excesses of progenitors there appears in the descendants a lowered vitality, stunted growth &c. Heredity is an important pre-disposing factor in chronic drunkenness. A whole host of imbeciles of the higher class owe their nervous instability to drinking habits on the part of their ancestors."

Bianchi in the article on Alcoholic Insanity in "Text Book of Psychiatry" edited by Macdonald "many grave psychopathic forms originate from the abuse of alcohol by the parents."

Clouston in "Mental Diseases" "Morbid cravings for alcohol or diminished self-control in regard to its use...are transmitted from generation to generation...by hereditary laws..."

Legrain in the article on "Alcoholism" in Hack Tuke's Dictionary of Psychological Medicine declares "The adulteration of good and pure alcohol for the purpose of making it meet the factitious wants which have grown up everywhere in modern society, has been
one of the most powerful factors for the degeneration of our race" and "The craving for strong drink is transferred from father to son."

Opposing the above, however, is Bevan Lewis "The subjects of alcoholic insanity...do not exhibit any unusual degree of the insane heritage...not attaining to the average heredity of all forms of insanity alike." (Alcoholic Insanity, in his Text Book of Mental Diseases.) This last quotation may be questioned as bearing on the point but evidently if the authority of the previous witnesses be accepted the children of the alcoholic insanity insane should be also insane.

Largely supporting the intemperate statements of the most bigoted teetotalers, then, is the evidence adduced by a numerous and influential body of alienists and others, but nevertheless it is necessary to enquire more strictly into the facts.

I may justify, as a preliminary, the statement that acquirements are not proved to be transmissible for though reasoning may suggest that certain properties acquired since the formation of the zygote are actually handed down to posterity there is as yet no evidence in proof of this. The fact adduced by Haeckel and accepted by others that the virulence of bacilli after passage through a susceptible host is such a proof, cannot be maintained. For a variation on the part of any of the earlier bacilli when introduced into the new host, would if this variation were
"selected" for perpetuation on account of suitability to the environment, be handed on, and as usual in the selection of variations, the handing on would be intensive, so that the final bacteria would differ very widely from the earlier progenitors, as might well be the case since scores of generations could occur in a very few days. There is no necessity in this case to postulate an acquirement, since variation will cover all the facts.

The point must again be emphasized that anything altered from the moment the zygote is formed in the human being is an acquirement and not a variation, and therefore incapable of transmission. The various degenerations that can be proved to occur in the case of children born of alcoholic parents prove nothing in this connection. For a child in the womb of a drunken parent is practically also another intoxicated person, and it would be unreasonable to expect that the alcohol-saturated child will not participate in the ordinary effects of drink, when exerted upon anyone else. There is no mechanism in the placenta, whereby toxins such as alcohol may be prevented from reaching the child, though such a mechanism does exist to prevent the filtration of bacteria. So that all the deteriorations, or so-called "degenerations" appearing in the child are explicable on the facts as they appear to us, without any necessity for believing in an extraordinary kind of effect upon germplasm.
which shall succeed in duplicating an effect already produced in highly organised tissues of adults. The idea too, that a desire for drink can be transmitted to germ-plasm in such a fashion that at a certain age this actual desire shall appear seems very much akin to the exploded notion that suggestions to the mother's mind can affect the appearance of the yet-to-be-born child, and which was exploded some generations ago. It seems incredible that even a poisonous solution soaking all the tissues of the adult shall be able to definitely affect certain pre-dispositions. The evidence so far is against any such belief and the onus of proof lies with those making the assertion.

We had reason to see in considering the effect of alcohol upon the various nerve centres that logically the last tissue of all to be affected would be that containing posterity, and that this tissue must by all analogy be the most resistant of all to environment. We have dismissed the fallacy that the actual appearance of weaknesses and disabilities in drunken offspring is any proof of inherited susceptibility, but if germplasm itself can be affected in any way whatever by alcohol then indeed there is or will be a complication that must be disposed of.

The article on Alcohol must again be referred to since it is a practical compendium of every phase of the question, and in it occurs the following:-
"The testes have been described as much atrophied in drunkenness but this event is very exceptional. Lancereaux has described an alteration in the seminal tubules of the nature of a premature senile change. and "chronic alcoholism appears to diminish the fertility of both sexes and to lead to a stunted and ill-developed off-spring." In these statements there is after all very little definite, and the most decisive I have been able to gather is by Bianchi who says" "The bad effects of wine on the products of fecundation during alcoholic intoxication of one or both parents is grave." This, however, is a most solitary instance. And if waiving the fact that it stands practically alone, it be decided to accept at least part of its implications viz. that germplasm and the consequent spermatozoon and ovum are susceptible to the influence of alcohol, which alcohol it has to be noted in the case we are considering and on account of the position of these cells, must be in excessively dilute solution; then we are confronted with this impasse: that this extremely dilute alcohol is yet powerful enough to perniciously affect a kind of tissue which it has already been decided must be the most resistant of all to its environment. And if even this difficulty also be waived we have yet to decide that the whole fabric of these cells can thus be so decidedly disorganised that their whole evolution is profoundly disarranged. The simplest method undoubtedly is to reject Bianchi's state-
ment altogether and since it has been pointed out that a state of affairs which cannot be denied to exist viz. that of a child in utero with steadily differentiating tissues bathed and surrounded by fluids containing alcohol, will account for all the facts of deterioration as we know them, then it would seem that we are justified a priori in such rejection. But in addition to this we have fortunately at our hand a posteriori evidence which strongly confirms this position. For if alcohol causes degeneration of the type suggested, races exposed to its action could last for only at most a few generations, so that if it can be shown that there are races existing to-day and races too with none of the stigmata of degeneration who have been exposed to alcohol for hundreds or better, thousands of years, then the fabric erected of an existent and actual degeneration caused by it must be dismissed as a myth. Unless it be maintained with Legrain that it is the adulteration of the alcohol that has caused the damage, but even so that is a side-issue and in no way affects the case for alcohol pure and simple.

Such races exist in the Jews, Southern Europeans and the Egyptians. The history of alcohol in Egypt exists for seven thousand years: the Jews were a drunken people in Biblical times; and there is no record of a time when the south of Europe was without alcohol. The history of civilisation is in fact an alcoholic history.
The facts at this point are not likely to be disputed: that Jews and the other peoples mentioned have been affected by alcohol for thousands of years, nor will it be claimed that the alcohol has been used by them in moderation, since all chronicles are able to prove the direct contrary: also that the races instanced are in no way inferior or more degenerate than the more northern people or tribes whose alcoholic records are comparatively recent history. It is hardly likely to be maintained that the present-day survivors of the alcoholic races are descended from teetotalers or from those who were always strictly moderate. And even if such a preposterous claim were made we have only to realise that in our time the gravest effects seem only to be produced on those whose previous record is a teetotal one, for instance the Maories, the red Indians of America or the Esquimaux and Southern Patagonians or Tierra del Fuegians. A long teetotal history seems then to be no benefit, rather the reverse. And there is in fact as much reason to claim that the tendency to immoderate drinking is inherited by those races who never have drunk, equally with those whose drunken history in our own country and time is stated to be the cause of their drunkenness, if we are to judge by the striking similarity in the effects of drink upon each of these. And this is evidently a reductio ad absurdum. So that we have no more right
to assume in the one case than in the other that
a direct desire for or tendency to alcoholism, phrase
it how you will, is definitely inherited, and we are
compelled to look for a common factor. This common
factor would exist, if the drunkard of to-day could
be shown to have a teetotal, and NOT a drunken ances-
try, but if so startling a deduction be at once re-
jected it will perhaps be safer to fall back upon a
more neutral and non-committal statement such as
"a mental instability is common to both."

I must not, however, just now enter more fully
into this discussion which will have to be again
taken up when the meaning of alcoholism, its province
and treatment fall to be considered. The immediate
question to be settled is that of alcohol upon the
germ-plasm: it has been shown that logically this
plasm should be the most resistant in the body, and
that therefore the effects produced upon it should be
almost negligible: it is admitted that only by action
upon it can racial degeneration be effected, and that
no matter how grave the results produced upon the in-
dividual, without such action these results are re-
stricted to him, and are quite compatible with a
posterity immune to drunkenness or at least non-drun-
ken: and the history of the oldest drunken nations
has been adduced as proving that the harmlessness
to the germ is actually substantiated by the world's
experience. We are therefore at the point at which
the contention that alcohol does not harm germplasm is not merely legitimate, but actually enforced by the evidence. And this in spite of definite statements made by Bianchi, Clouston and the other authorities in psychiatry.

There is another way of regarding the question, but it will be necessary to warn those who are not prepared to accept the foregoing as conclusive, that since they must accept one of the alternatives they will find themselves committed to a view of alcohol upon the tissues generally that may be repugnant. And to clear the issues. It has I think been most conclusively proved that the absolutely depressing effect upon germplasm cannot be maintained. There are only two other possibilities: the first that the plasm is unaffected, and the second that it is affected but since depression or devitalisation has been ruled out of court, that this effect must be one of stimulation. No other courses are open.

If the result is no change whatever, then the claims of the alienists again must be rejected; but probably to most minds there will be little satisfaction in such an hypothesis, and we are irresistibly carried to the last possibility that change is produced, and that this change is in the direction of resistance, or stimulation does actually occur. And now it is necessary to deal with the manner in which resisting power can be increased, and if the suggestion
has been accepted that alcohol is practically a toxin, the natural conclusion will be that an antitoxin must be formed. It is not to be assumed that I do assume the formation of such antitoxin: it is merely a legitimate deduction from the premises. And the idea of such anti-toxin has naturally occurred to others. For instance Dr. Saleebey in a little book on Heredity, p. 75 says "Germ cells may be influenced to produce antitoxin, and consequently the sperm and ovum from them be protected." If this does occur then we have at last an instance of an acquired character which will be transmitted. But regarding this Archdall Reid says in a private letter to myself "I rather doubt the suggestion of the germ cells producing antitoxin. There is differentiation of function amongst cells. The production of antitoxin appears to be a function of certain cells. If they do it for the whole organism it is not easy to see why the germ-cells should do it for themselves."

So that again we are in difficulties, for as Reid says it is difficult to understand why a work normally delegated to other tissues, that of elaborating anti-bodies, should in this special instance be taken up by the germ-cells and if we are to assume that it does occur in the case of alcohol in which those subjected longest to its influence appear to possess the greatest resistance, the same assumption will have to be made in the case of the races which
show the highest degree of stability against tuberculosis and other diseases. That is to say the plasm must be presumed to have an infinitely adaptive power to formulate toxins-against, since the attacking body is different in every case. And since this seems to be a complicated explanation, it would seem better to waive the antitoxin theory altogether and postulate one power that enables the plasm to resist all noxious and as a corollary, also beneficial influences equally: that power being a passive impregnability. So that on this theory the Jews, Italians &c. who have persisted owe their persistence to the stability of the protoplasm of their ancestors.

The problem narrows itself to this: that if the plasm is at all susceptible to alcohol it must be in the way of degeneration, and that such plasm will shortly in its posterity be exterminated. Plasm which persists for hundreds of years does so because it is insusceptible. So that now to my mind, we can see a fair ground of compromise which will give a modified weight to the opinion of the alienists, and that compromise is based on the dissimilarities existing between all portions of matter of even the same kind. It becomes, if you prefer it, a question of idiosyncrasies of different germ-plasms. Some it is permissible to think will be more susceptible than others; will be affected by alcohol; and will in consequence reveal degenerations in the derived indi-
individuals: degenerations bodily, mental and racial, ultimately probably leading to extermination and sterility, one of the most marked of degenerative stigmata. The others, insusceptible, will have the task of continuing the race, and will naturally display what is termed an immunity to alcohol. Alcohol, then is evidently a potent element in the environment by means of which selection in the case of those races least accustomed to it is being still steadily pursued. Nor probably, as alcoholic solutions are obtainable now in much greater strength than in the days of the more naturally obtained wines, has this selection ceased even among the stable races. The explanation of the complete extermination of tribes which in the last few years have attained access to it, is self-evident. For they are introduced at once to whisky, the most potent of all alcoholic beverages. No selection is possible: the strongest solutions in the largest quantities obtainable are used by the Maories, for example, of any age. There is no gradual initiation through the weak wines for centuries, and till recently at least there was none of the difficulty in obtaining it which beset the path of those others who, in European history debared from alcohol, set their steps towards it, over even the walls of Rome. Easy access and poisonous strength lead to a perfectly logical result. And the fierceness of the appetite at once provoked is a striking
commentary on the belief that this appetite is due to ancestral indulgence. In such a case it is hardly necessary to presume a degeneration of the germ plasm since the individuals themselves are so rapidly killed off that this is hardly needed to account for the extermination.

As a result of the investigation into the action of toxic or harmful quantities various damages have been traced in individuals, in special individuals also the harm done being also perceptible in the germ cells and the product of true degeneration—this having been assumed. The consequences on our own national life call for consideration.

Alcohol in the United Kingdom is consumed chiefly in the form of Wines, Beers and Spirits, and for the year 1902, Whitaker’s Almanac gives the relative amounts as 25,281,000 gallons, 1,270,828,000, and 44,078,000 gallons respectively; or if estimated in gallons per head of the population .36 of wine, 30.3 of beer, and 1.05 of spirits. If it were only then by reason of the amount drunk, the question of effects is well worthy of attention in the case of a dubiously, at best, harmless article. But without going at all into the question of whether or not the various statistics show increase or diminution, the following facts emphasize still further the pressing necessity of at least more definite knowledge.
In the Blue-book published in 1906 which gives the criminal statistics for England & Wales, the offences under the heading of Drunkenness for 1904 numbered 227,403, a large number surely since it is in everyone's common knowledge that it does not represent a tithe of the drunkenness that actually does occur. The worst counties for drunkenness are Northumberland, Glamorgan, Durham and London; the best position as regards this offence being taken by a large group of rural counties. During the same year 418 persons, of whom 380 were women were sent to Inebriate Reformatories.

Regarding Insanity, Dr Clouston in his Report for the Royal Edinburgh Asylum 1905 says "Admissions due wholly or in part to excess of alcohol 25.7 per cent, the average for 5 years being 25 per cent." The figure given by the Commissioners for Lunacy in England and Wales for the latest year I have been able to get-1903, show that for the quinquennium 1899 to 1903 the percentage admitted to pauper lunatic asylums in whom alcohol was proved by the medical officers to be either the predisposing or exciting cause of the insanity was 23.6 in the case of males and 9.6 in females. The total average number for each of those years being 2,249 males and 976 females insane through drink.

On alcohol as a cause of disease, death, or suicide no satisfactory statement can be made, nor
equally can the figures be given of the homes ruined and broken up, to say nothing of other lives strained shattered or embittered. Some attempt does seem to have been made to collect instances of deaths due to alcohol but the number given is merely ludicrous. The undoubted fact seems to have been attained in only about 1 in 20,000 in the Registrar-General's Returns but there are evident reasons in England for the physician, even if he knows, not certifying a death as due to alcohol; and a very short investigation will convince that the deaths from this cause should not be written down as less than 20 per cent of the total.

These then, are the mere facts: that as a result of alcohol crime is increased, disease death and insanity incurred, while misery and drunkenness are accompaniments; and all on account of an alcoholism which as Metchnikoff says "shows plainly the prevalent existence in man of a want of harmony between the instinct of choosing food and the instinct of preservation."

The actual beginning of the drinking habit varies greatly, but it may be at once dismissed that it ever begins as a desire for alcohol. Such a desire cannot arise till alcohol itself has been once at least tasted, and then it will not occur unless the sensations &c induced are distinctly pleasurable. The after-consequences are a different
affair. In the majority of cases people take to drink because they like its effects, though there are instances where in spite of nausea produced at once and for some time persistence for the sake of "doing like the others", has succeeded in overcoming an initial repugnance and may ultimately breed a drunkard. Those who drink alcohol in any form, simply as they would drink any other liquid, for the sake of satisfying thirst need not be dwelt on: nor need those who find their pleasure in mere titillation of the palate and nostrils since any excess blunts these enjoyments: the effects produced in the last two classes cannot be very detrimental: they are only to be feared in the drinkers for the sake of the alcoholic effects. And as has already been said there is in even these, no inborn desire for alcohol. There is however, an organisation which will respond to its narcotism in definite ways. Alcohol is chosen because usually it is the first narcotic experienced on account of its ubiquity, frequently in fact being the only one known by the individual; but there seems to be no reason to believe that if morphia, cocaine &c had been discovered and were equally accessible these would not be equally chosen or preferred. And once adopted the alcohol is merely continued by a kind of inertia. The introduction to the alcohol occurs usually socially, but may be made as a result of medi-
cal advice, and it comes to be a question as to wheth-
er a medical man is justified in prescribing this
drug as such.

We have already seen that every point of its
action on digestion, circulation, metabolism, and
bodily influence generally is the subject of the most
irreconcilable differences of opinion, and in all
ordinary cases it is probably safer that the phy-
sician should not take the responsibility of any
recommendation. We are not yet sufficiently edu-
cated to be able to say that an uncontrollable appe-
tite will not arise in any given individual, but
although this has to be noted as a possible source of
danger, and although there are many wild statements
as to the evils which have resulted from the medical
prescription of alcohol it is probable that these are
not based in fact. In the article on Chronic Alco-
holism in Sajou's Encyclopaedia is stated:- "In a
study of the subject in over 3000 cases of inebriety
I was unable to trace the initiation of the alcoh-
lism as due to medical prescription in more than
\( \frac{1}{3} \) per cent." That proportion, however, is quite
worth guarding against. There are cases indeed,
which as every clinician knows, really demand the
exhibition of alcohol as in different fevers where
primary digestion is absolutely impossible, and
where life itself can only be preserved by a food
that requires no such primary digestion. And other
cases, more debatable perhaps, where the first demand is one of stimulation, a property denied by many to exist in alcohol. On the latter point it must be observed that the most valuable stimulants, though containing alcohol, are those liquors in which the alcohol is to some extent converted into various ethereal bodies by the action of malic, tartaric and tannic acids obtained from the grape. The stimulating value in fact appears to depend chiefly upon the extent of this conversion, so that the best cordial is a very old matured brandy or wine.

Professor Murray of Newcastle in his "Rough Notes on Remedies" lays especial emphasis on this and declares that there is a marvellous sphere of usefulness when the patient is far beyond the region of controversy, for the best "Liqueur Brandy", and he gives instances of its effect which he traces to an "explosive" (p.141) effect as distinguished from ordinary combustion. Thoroughly well matured whisky, made as described in the pot-still, will also possess a large proportion of these "ethers" and be of a corresponding value. Patent still whisky is evidently valueless in this respect.

The use of alcohol in other than vitally urgent cases is probably not justifiable, and in the ordinary forms of commercial fluids, possibly not even useful, and altogether it is desirable that the professional conscience should be acutely on the alert.
when the contingency of such prescription has to be faced. It was not for nothing that 14,000 medical men thought it worth their while to present a memorial that the effects of alcohol should be made a subject of exposition in the schools of the country.

I do not propose to elaborate the question of alcohol as a factor in the production of the disease of the country: from the facts observed in the effects produced by excess on the different tissues this causation is sufficiently obvious and, whether as exciting or predisposing agent, of vital import in innumerable varieties. Its progress as a disease-producer is probably fairly indicated by its influence as a factor in insanity, and to this I will now proceed. And although the various insanities ascribable to alcohol from the acute delirium tremens, and mania a potu to the more chronic forms have each their definite descriptive name it will not be necessary to go into this detailed enumeration but simply to accept the word "insanity" as covering all manifestations. And in these should be decidedly included drunkenness itself: Maudsley for example describes this as a "chronicle of the successive phases of insanity displayed in a short period of time" and this point requires surely no further enforcing.

Figures have already been quoted concerning the
relation observed to exist between alcohol and insanity, and the statement is frequently though somewhat loosely made that both alcoholism and insanity are on the increase. Perhaps it will be as well for me to say, what has throughout this thesis been implied that the term "alcoholism" is used to cover all the more serious results produced by alcohol, without any attempt being made at the differentiation between drunkenness, inebriety etc or the explanation of the one by opportunity and the other by a condition of mind and so forth. To me, as a matter of course, excess of any kind, whether helped by opportunity or not, is due to determining conditions of mind.

Before examining the facts a few quotations may be made: Ridge in "Alcohol and Public Health" p. 63 says "It is perfectly certain that one fourth to one third of the lunacy of the United Kingdom is a result of the custom of drinking alcoholic liquors." Garnier in the Quarterly Journal of Inebriety Apr. '92 "In fifteen years lunacy has, in Paris, increased 30 per cent, due to the advance of general paralysis and alcoholic insanity. The latter is now twice as prevalent as fifteen years ago." We may note en passant the growing favour of absinthe, which containing a powerful convulsant poison, must complicate the attention paid to this view. In an editorial in the Med. Record Sept. 25th 1897 it was stated "In England drunkenness is increasing." Clouston in
Alcoholic Insanity in his "Mental Diseases" "It is the most common of all the causes of the disease (insanity). From 15 to 20 per cent taking the country through may be put down to alcohol, wholly or in part." So much for the existence of a causal relationship. But Bevan Lewis in a paper quoted by the B.M.J. of 10th March of this year, 1906, gives tabulated statistics showing that inland and agricultural communities were the least inebriate and yet had the highest rate of pauperism and insanity, while maritime mining and manufacturing communities above all others were the most intemperate and revealed the lowest ratios of pauperism and insanity. And as to the fact of any increase of insanity. The Blue-book on Criminal Statistics for 1906 says (p.16) very curtly "Drunkenness is stationary". And Clouston regarding any increase in insanity says:—The admission rate of private patients to Scottish asylums has not increased in comparison with population, and this he maintains to be the true test. Some years ago the statistics for insanity were examined in Hack Tuke's Dictionary of Psychological Medicine for the years 1878 to 1890 and those statistics do not "appear to support the opinion that a distinctly larger number of persons in proportion to the population become insane, than was formerly the case." I have myself gone most carefully into the Reports of the Commissioners for Lunacy for England & Wales, and
find that though the figures at first would give the impression of a most alarming increase, they have to be considered along with various legislative changes and improvements of diagnosis that have occurred in the same periods.

<table>
<thead>
<tr>
<th>Year</th>
<th>Males</th>
<th>Females</th>
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<tbody>
<tr>
<td>1859</td>
<td>573</td>
<td>504</td>
</tr>
<tr>
<td>1879</td>
<td>390</td>
<td>341</td>
</tr>
<tr>
<td>1899</td>
<td>322</td>
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<tr>
<td>1901</td>
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<td>287</td>
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<tr>
<td>1903</td>
<td>310</td>
<td>278</td>
</tr>
<tr>
<td>1904</td>
<td>304</td>
<td>275</td>
</tr>
</tbody>
</table>

The above for the years indicated give the ratio of sane males and females to one male and one female in the pauper asylums. The last report (59th) says "there is no apparent relationship between the density of population and the ratio of insane.

The percentage of cases of lunacy (total number) caused by alcohol as either exciting or predisposing agent:

<table>
<thead>
<tr>
<th>Year</th>
<th>Males</th>
<th>Females</th>
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<tbody>
<tr>
<td>1878</td>
<td>21.3%</td>
<td>7.9%</td>
</tr>
<tr>
<td>1887</td>
<td>18.9</td>
<td>7.9</td>
</tr>
<tr>
<td></td>
<td>22.0</td>
<td>9.1</td>
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<tr>
<td></td>
<td>23.6</td>
<td>9.6</td>
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</tbody>
</table>

These Reports of the Commissioners, it is to be observed, refer only to about four-fifths of the total insane population, these alone being under their
jurisdiction, the remaining fifth being in workhouses, in receipt of out-door relief, or with relatives &c. But relating as they do to the bulk of the insane, they are a fair criterion and in the 25 years from 1878 show a very slight increase in those insane from alcohol, and even this might be susceptible of explanation by greater accuracy of observation. The Report for 1905 "in the pauper class insane to population has grown pari passu: there is no such parallelism in connection with private patients."

The net result then one must infer is no increase in either alcoholically or the generally insane. The explanation of apparent discrepancies is that the only true test of the progress of insanity is the number of first attacks, and these show no perceptible alteration.

The belief that actual insanity from alcohol or otherwise is increasing, not being corroborated, this at once disproves the statement that alcohol is a cause of degeneration of the race, a conclusion which has already been arrived at on different grounds. It is curious to notice how even the most plausible of theories, and the most ingenious and apparently unanswerable of experiments, will lead to the establishment by reasoning what only the facts are capable of proving to be a "non sequitur". That experiment, for instance by Frère reported in the Journ. de l' Anatomie &c of Mar & April 1895 where experimental
dosing of hens' eggs with alcohol delayed and modified development, resulting in monstrosities and anomalies.

The truth seems to be so far as I am capable of arriving at it, that in the majority of people, the germ-plasm is practically insusceptible to the influence of alcohol, but that in some instances it may be affected and degenerations result. In a large proportion however, of the cases where at first sight this susceptible plasm seems to account for the facts, it is not necessary to postulate this, but to realise that in an already unstable organism similar effects will be produced by alcohol, and that in these cases it is not necessary to assume any special alcoholism as the cause of the instability. The condition is, if you like, brought into relief by the alcohol. Though no doubt in special circumstances, if persons of good cortical organisation, deliberately and persistently drown themselves in drink, they can produce mental weaknesses, which will not however be handed down to their off-spring. Most of the cases of the children of drunkards becoming also drunkards are due to environment and the effects of the pre-natal alcohol bathing their brain tissues in weakening development of these. I agree with the opinion that alcohol still is, and has been from time immemorial an important selective agent, and that
there is no possibility of evading this selection. If it were conceivable that alcohol could be abolished an important factor in determining the mentally unstable would be lost, and it is questionable whether the gain would preponderate. It seems to me extremely true that alcohol gives a criterion of psychical stability. We do not need the evidence of specialists in psychology or insanity to convince us that if any weakness or instability exists in a brain, that instability will be promptly revealed in even slight alcoholism. Without dwelling upon this further, it is perhaps now permissible to pass to the consideration of what ought to be done, or if anything should be done to attack the apparent evils due to alcohol. These include death, however caused or hastened by it, disease, crime, drunkenness, insanity and the protean forms of mental misery and physical wretchedness which may come in its train.

Before considering any suggestion for present-day treatment of a condition which we are liable to forget has always been a pressing problem in all civilised countries, it seems to me absolutely essential that their experience should be utilised and the lessons learned which have been already taught. And perhaps as good a beginning as any may be made with the attempts which have been made in the past to stop drunkenness by punishment of the drunkard.
"The ancient Grecian was penalised for excess... Lycurgus the Spartan prohibited drinking except for the express purpose of quenching thirst. He cut off the legs of drunkards and destroyed all the vines. Solon condemned an archon to death for being drunk, and the Senate of Areopagus penalised men for standing too long at the wine bar...Pittacus...inflicted double punishments for a crime committed in drink" from "Inebriety among the Ancients" p58. Charlemagne prohibited it, so did Frederick the Third and Karl the Fourth among the Germans, and among this people arose Orders of Temperance with very severe methods. See the History of Drink by Samuelson pl04. Yet German intemperance became notorious. Sir Joseph Jekyll's "Gin Act" in 1739 tried to do the same for Great Britain, which has always been intemperate. Yet to-day we still hear the clamour of one section at least for Prohibition.

And this method - of Prohibition- has been credited by its devotees with miraculous powers, but the experience of it has been uniformly disastrous. And facts on this question are to be obtained in the book by Messrs Rowntree & Sherwell "The Temperance Problem and Social Reform". At the time of publishing of this volume, Total Prohibition had been tested and abandoned in ten of the States of America, but was still in force in five others. It was found that there
is a direct connection between density of population and the success or otherwise of this measure: and that the sparser the population the better the result. In 1890 in the five prohibition states five per cent of the people lived in towns of 30,000 and upwards, and not a single town in these states contained a population of 50,000. When the Prohibitory Law was passed in the five states which continued under it the people were 18 to the sq. mile; in the ten which later abolished it was 44. At the stage of this abolition by the majority the numbers had risen to 23 and 98 respectively. The authors say "The figures are certainly suggestive and go far towards compelling a conviction of the impracticability of Prohibition in thickly-populated districts. As a matter of fact Prohibition, however successful in rural districts has invariably failed when applied to important urban centres." In 1888 the convictions for drunkenness in Portland the prohibition Capital of Maine were 42 per 1000; in New York 13; Chicago 23; and in Boston 45: Portland having at that time 41,000 inhabitants and New York 3½ millions. It is to be noted that 44% of those convicted in Boston were absentees - people who had come in from prohibition territory to procure drink, see p.158.

Local Option has been tried in most American States, and on the same authority has had partial success where the people are few: on the other hand,
Cambridge, a suburb of Boston and with a population of 80,000 the largest town under such enactment in the U.S.A. doubled its drunkenness after adopting No Licence.

The experience of Canada is strictly similar, prohibition completely failing where population is at all dense. In New Zealand, in the "King Country" where prohibition was enforced on account of the population being almost exclusively Maories "the Maories Chiefs have asked the Government to substitute a limited licensing scheme for the prohibition in force. Mr Seddon approves... The chiefs and the police were unanimous in stating that prohibition had spread the evil it was intended to exclude." Morning Post, 29th October 1900.

The Gothenburg system greatly diminished the consumption of spirits in Scandinavia, but in Gothenburg, arrests for drunkenness which for 1875 to 1879 averaged 39 per thousand of the population had in 1898 increased to 56 per thousand. The only possible deduction in this last case seeming to be, since it is granted that the policing is no stricter, that the excessive drinkers at any rate have not been lessened though their drink has been changed to the weaker solutions.

The different attempts then, to eliminate drink, seem to offer little encouragement, and it is indeed
questionable as is so ably argued by Archdall Reid in his "Alcoholism, a study in Heredity" whether even if the total elimination of alcohol were possible, it would yet be desirable. For as is evidenced by the Jews and others to whom alcohol has been known for thousands of years, and by ourselves as compared with Maories and Red Indians, there is a progressive evolution of resistance against the charms of drinking, which if the drink were totally removed would like any other painfully developed character promptly begin to retrogress. So that in a very short time we or our posterity would soon be back again at the time and point as regards alcoholic resistance, which in some cases it has taken hundreds of years and in others thousands, to leave. And as the alcoholic temptation would again inevitably arise, since it is derived from food products and it is not possible to also eliminate these, the drunkenness of history would again have to be paced till our present position of advantage should again be reached. That is to say in brief, hundreds of years would be lost if the temperance fanatics could have their way. Teetotalism then, since it cannot be a permanent institution, and since it would cost us evolutionary steps already made is to be ruled out of court as a suggested remedy. Reid under the heading "A theory of Retrogression" sums up the points concerning the evidence for which in
detail his book must be consulted 1) that characters acquired by the parent are not inherited by the child; 2) that evolution results from the stringent elimination of the unfit; 3) that when the elimination which has caused the evolution of any character, ceases or nearly ceases, that character undergoes degeneration; and 4) that degeneration is due to atavism - to a process of reversion which, step by step, retraces the previous evolution.

Alcohol then is a means of stringent evolution, as potent for instance as tuberculosis or malaria or the zymotic diseases, but acting differently from them in so far as it is not infectious or contagious but acts by an appeal to cerebral characteristics.

It seems likely then that in Britain till alcohol has been for a considerable period obtainable freely by all classes we shall still see this as a more drunken country than Italy for instance where in Tuscany though even the servants drink a litre of 10 per cent strength wine daily a drunken person is a curiosity. See Reid's Principles of Heredity. It is easily conceivable why the English are backward in this respect since grapes the natural and easy source of alcohol do not reach our climatic zone. So that the extraordinary suggestion seems to be almost permissible that instead of restricting the supply, it should be made universal. This however, is not indicated as we have striking illustrations among
the Esquimaux and other peoples already mentioned, as well as what will ensue if access to strong solutions is made too quickly and easy, and in England there is a long way to go before we attain the immunity of the Jews &c. who have trod along a path beginning with dilute solutions for innumerable generations. This however, does suggest a definite idea and that is, that no alcoholic beverages should be sold containing more than a maximum of say 5 per cent of alcohol. It is not supposed that such a measure would stop the drunkard: we have the evidence of Gothenburg to the contrary. But it would prevent the so to speak accidental drunkard from being so frequent in occurrence from the desire to be "sociable", and it would lessen the individual degenerations which are undoubtedly more liable to occur with strong solutions.

A further point that occurs in connection with this question of the degeneration caused in the individual is that of age, and naturally the effects are greater on the growing or not fully established organism, so that a definite age limit of 21 at lowest might be worth considering.

Education as it is popularly understood I consider to have very little bearing on the subject, except in the widest possible sense of being the provision of an environment whereby all that is desirable in the human unit shall have the opportunity to expand, which undoubtedly would help negatively to suppress
those that are undesirable. Climate, so far as it is a cold one, provides merely an excuse for drinking and has no more to do with the consideration of alcoholism than serves to connect this with the regions where grapes flourish. The inhabitants are drunker in the more temperate regions than in those further south because their opportunities for evolution have been restricted in this respect, for as cannot be insisted upon too often or too strongly, in Reid's own words:— "As regards narcotics and disease the ease with which the race evolves resisting power, bears a close relation to the ease with which the individual is able to acquire personal immunity." And as we all know very little personal immunity can be acquired as regards alcohol. This has to be evolved by the secular experience of the race.

Early closing, for instance in Edinburgh, is claimed to have achieved much but there are numerous fallacies and from my own recent knowledge of the night drinking clubs which flourish there, I doubt entirely that the drunkenness of drunkards if not affected for the worse, is at all benefited.

Teetotalism I believe to be useless and positively dangerous, with Reid.

The moderate drinker with no special intention to exceed would be protected by a compulsory weakening of the solutions sold.

The immature from the view-point of age and
development should be debarred from touching alcohol, and this could be enforced by making the parents, guardian or other relatives responsible and liable to punishment for omission to enforce this.

Drunkenness itself, I should hold as a valuable indication of those who are defective mentally in whatever slight degree, and consider therefore they who get drunk should be treated by detention for varying periods: health and discipline bodily and mental being attended to as is the case with other mentally defective persons.

So far as the drug treatment of inebriety is concerned, one fails to see how it can touch the root of the matter. In isolated cases, perhaps, the injection of strychnine and atropine combined with the effects of suggestion, may be of some service, but these must be cases in which the cortical weakness has not proceeded too far and in which the heredity is fairly good. It is impossible to understand how a hypodermic syringe could be expected to repair an actual breach in cortical strength. And in the institutions for this treatment apart altogether from the more or less legitimate trickery by means of which the patient is sometimes deluded into the necessary beliefs, a considerable amount of benefit is undoubtedly derived from the attention paid to the general mental and bodily condition.
While I firmly believe that anyone who gets drunk more than once though he knows what will happen, proves himself to be lacking in a respect to which it is desirable the race should as soon as possible attain, I would not suggest that the individual who gets drunk two or three times should be treated like a criminal lunatic. But the chronic drunkard, and the dipsomaniac whenever found ought to be segregated and prevented from conception. For, whether an inherited weakness has led to the inability to keep away from drink, or whether the weakness is as happens in some cases due to the persistence of a factitiously acquired desire, these people are useless to the state and a source of absolute misery and bodily danger to their relatives and friends. Even if it be granted that in some instances the children these men would leave might not also be tainted with the defects that tend to cause alcoholism, the risk is too great and it is better that the state should be bred from those children whose parents show no such weakness. This method would hasten a selection and increase the alcoholic resistance of the race much more rapidly than can be at present possible.

It is surely better to endeavour to rear a people who shall be able to preserve the alcoholic immunity already secured, and who shall all be able to dispose of what has been termed the physiological amount of
alcohol without harm to themselves and with positive benefit to the species since immunity is thus not allowed to lapse: this immunity being of course an absolute immunity whereby alcohol not only has little effect in ordinary quantities but the mental condition of the imbibers is such that there is no crave created: there is very little acquirement of personal immunity to drink. For, the other method which at first sight appeals most strongly to anyone who sees the misery caused by drink, of suppressing the drink altogether by Prohibition is reluctantly admitted to have failed altogether in the past by what might almost seem to be a prevision of the immense national calamities that would result in the future should an effective Prohibition ever reign. Though the present evils are sufficiently grave, and though mere academic reasoning may fail to remove the feeling of responsibility for immediate action and the sorrow for those who are cursed by drink in our own time and actual presence, yet the thought and belief that were teetotalism enforced the resultant miseries would be quadrupled in proportion as it was "successful" is sufficient to force one's acquiescence in a reluctantly acquired conviction.

Inculcation, persuasion and education must all subserve the endeavour to attain wherein lies the only solution - moderation.
APPENDIX.

Note a) Concerning amyl alcohol, though the statement is usually made and accepted that this is the cause of the tremendous cerebral and motor excitement in those alcoholic solutions, which seem to make many men "fighting mad" Hutchison "Food & Dietetics" gives much evidence against this view. He points out (p. 346) that there is not more than one-tenth per cent present in even a bad whisky and that for marked ill effects at least 1% is required. Allen swallowed for a month considerable quantities of whisky containing 2% fusel oil without bad results. The evidence of Samuel and Zuntz is quoted on the same side. Further as has been stated it is by no means proved that fusel oil is in less amount in a well-matured than in a young whisky. The local irritating effects on the stomach is possibly the fur-furol in immature spirits.

b) Regarding the deaths ascribed to Alcohol, see "The Principles of Heredity" p. 190. The Registrar-General announces it as .26 per cent. In Switzerland where the death certificate is a secret official document it is credited as 2.47 - while with deaths indirectly due to alcohol the figure rises to 10%. Evidently alcoholic elimination is definitely
comparable with that caused by tuberculosis, against which also no personal immunity can be acquired.