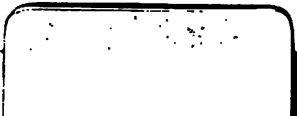
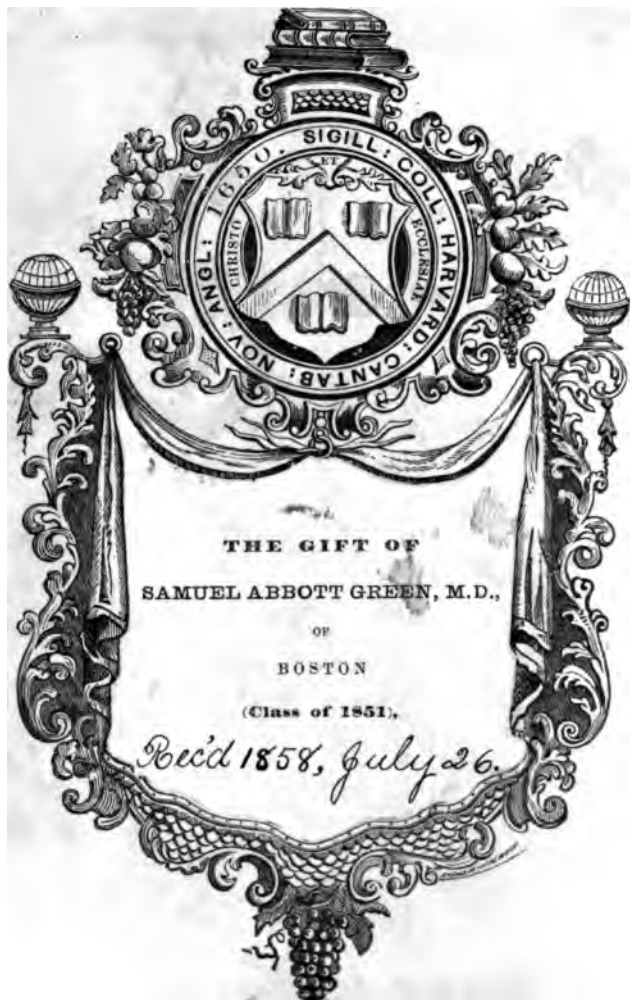


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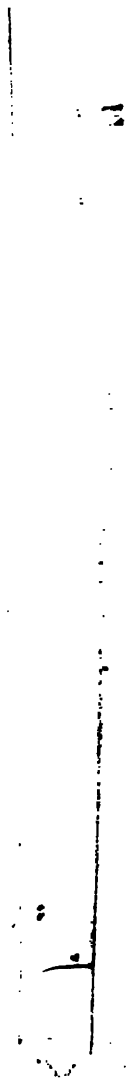
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FOOD,

ETC.



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ALCOHOL

AND THE

CONSTITUTION OF MAN;

BEING A

POPULAR SCIENTIFIC ACCOUNT

OF THE CHEMICAL HISTORY AND PROPERTIES OF ALCOHOL, AND ITS LEADING EFFECTS UPON THE HEALTHY HUMAN CONSTITUTION.

Illustrated by a beautifully colored Chemical Chart.

BY
EDWARD L. ^{Y. Youmans}YOUNG,
AUTHOR OF THE "CLASS BOOK OF CHEMISTRY."

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## PREFACE.

THE following pages will be found to contain a familiar description of those scientific facts and principles which illustrate the nature of Alcohol, and its influence upon the human constitution. The progress of science has made it desirable that such a work should be prepared. The science of Organic Chemistry, the Chemistry of plants and animals, upon which this question largely depends for elucidation, has been greatly advanced within the last few years, which enables us to present many points of the subject with much more clearness and satisfaction than was previously possible.

The work is intended to diffuse a kind of knowledge among the people, in which they are too generally deficient. To acquire this information, they must be able to understand what they read; and I have therefore endeavored to present the subject in a style as free as possible from technical terms, and that may be comprehended, upon careful perusal, by all persons of common education, although untaught in science. The principle of the Author's large Chemical Chart, which has been approved by the ablest Professors and Teachers of the country, as the best method of inculcating rudimentary Chemistry, is now, for the first time, applied to the illustration of a special branch of the science. The accompanying diagrams will be found of much value in simplifying the subject, and aiding the reader to form and retain correct ideas concerning the Chemistry of Food and of Alcohol.

As the question is intrinsically and throughout a scientific one, it will be seen that I must explain, as I proceed, so much of Chemistry and Physiology as may be needed to illustrate the main topic. Thus, in order to understand the true nature and relationships of Alcohol,



I found it necessary to explain something of the properties of organized substances generally, and especially of that class which comprises the alimentary principles of diet; that I might show how it is that a liquid, taken into the stomach, revolutionizes the intellectual nature, it became important to set forth, in a clear light, the absolute dependence of mental operations upon material conditions of the Brain. It is hoped that these portions of the work, independent of their bearing upon the main subject, will be found far from uninteresting, as they cast light upon the means and policy which God, the Infinite Author of science, employs in sustaining the daily life of a human being.

It can hardly be necessary to caution the considerate reader against expecting, in this little work, a full discussion of all the topics its title may seem to involve. I assigned to myself the task of establishing and explaining certain important facts and principles, and of stating the conclusions to which they lead, in the narrowest compass possible. It would have been easy to multiply facts, authorities and observations, so as to make a *large book*; but who could be found with time enough to read it?

In the arrangement of the subject I have followed a plan which enabled me to present it most effectually to the popular mind, rather than one commended by the strictness of its science.

I am much indebted to the valuable work of that Eminent English Physiologist, Dr. Carpenter; and, in making extracts from it, I have taken the liberty of modifying his language, where it seemed too professional. I have made free use, as will be seen, of a capital paper by that distinguished physician, Dr. J. W. Francis of New York; and would also acknowledge my indebtedness to the able work of Dr. Ray, Superintendent of one of the Eastern Lunatic Asylums, on the Medical Jurisprudence of Insanity.

SARATOGA SPRINGS, Nov. 1858.

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# ALCOHOL

AND THE

## CONSTITUTION OF MAN.

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### I. CHEMICAL ORIGIN, NATURE AND PROPERTIES OF ALCOHOL.

1. *Origin of the Earth's Vegetation.*—The great source of all vegetable forms upon the surface of the globe, is the atmosphere which surrounds it. Through the agency of forces which radiate from the sun, acting upon gases which compose the air, the vegetable world is called into existence. Excepting the slight amount of ash left after burning, all plants may be looked upon as condensed and solidified air. As the atmosphere consists of the same chemical elements all over the world, so also do plants; and as the atmosphere is composed of but four different kinds of matter, so, too, is almost the entire vegetable kingdom.

2. *Chemical Elements of which Plants are formed.*—The chief mass of all vegetable substances is made

up of the four chemical elements—*Carbon*, *Oxygen*, *Hydrogen*, and *Nitrogen*. These are represented upon the accompanying chart by square diagrams; the size of the square, in each case, indicating the proportions by weight in which the elements enter into combination with each other. *Carbon*, which we know familiarly as charcoal, is a large element of all living or organized substances. Of the four great elements which compose living structures, Carbon is the only solid. *Oxygen* is a gas composing one-fifth of the air, and distinguished by its powerful attraction for other elements. It combines with them with such energy as to produce combustion. Fire and burning are simply the result of Oxygen violently uniting with the elements of which fuel, or burning bodies are composed. It can also combine slowly with these substances, as in common decay, or in breathing, when the Oxygen enters the living body and unites with, or slowly burns its elements, thus maintaining the temperature of the healthy system at blood heat. *Hydrogen* is a gas not found free in the atmosphere, but exists in water, forming one-ninth of its weight. Plants have the power of splitting the water-atoms to get the Hydrogen, which they put into all the compounds that they make. When these compounds decay or burn, the Hydrogen combines again with the Oxygen, forming water. Hydrogen has a very strong attraction for Oxygen, and produces an intense heat

by combining with it; so that the richer a compound is in Hydrogen, the more heat it yields in burning. *Nitrogen* is a gas which composes about four-fifths of the atmosphere. It has feeble attractions towards other substances; unites with them reluctantly, and then leaves them so easily, that the compounds it forms are of a very changeable nature.

3. *True Office of Vegetation.*—It is not in their pure or simple state that plants make use of these substances to build up their structures, but in the compound forms of *water*, *carbonic acid*, and *ammonia*, formed, as is seen by the diagrams upon the chart, from the four bodies just described. From these three substances—the first a neutral body, and the two latter violent poisons, when respired by animals—the bulk of all vegetation is produced. It is the grand office of plants to convert these dead, unorganized, and poisonous substances, into living compounds, capable of becoming food for the animal races. They enter the plant through the roots, dissolved in water, or are absorbed from the air by millions of microscopic mouths opening upon the surface of the leaves. Under the influence of solar light, acting upon the green parts of vegetation, they are there decomposed, and their atoms re-arranged into new and more complex groups, forming the infinitely diversified products of vegetable growth. By the subtle

synthesis of the sunbeam, noxious and deadly exhalations are transformed into the vital aliment of man,—the material for muscle and nerve, and brain. To decompose carbonic acid, water, and ammonia, and bring their atoms under the influence of new and higher attractions, is thus the great purpose of vegetation. The plant is constructive; it builds together dead matter into the condition of life. The chemical relations of the dead gaseous matter, and the living compounds which are formed from it in the plant, are beautifully shown upon the colored chart.

4. *What is Organization?*—This construction, or building up of living forms and substances, is called *Organization*, because living beings possess *Organs* by which they are enabled to grow; as, for example, the roots and leaves of plants. *Organic* or *Organized* compounds are such as living beings form within their structures out of decomposed mineral matter, which may be either gaseous, liquid, or solid. This last form of matter is called *Inorganic* or *Unorganized*. *Disorganization* is the separation of the atoms of an *Organized* compound into the mineral or *Inorganic* condition.

5. *Alimentary Compounds of Plants.*—Although the materials which nature employs are so limited and simple, yet the products of vegetable construction are almost boundless in variety. Of these, but few are employed by man as food, and they are all represented

upon the accompanying chart. The alimentary principles of food, as they are called, are divided into two great classes. First, those which we see by the lines are formed simply from carbonic acid and water, without the aid of ammonia. They hence contain no Nitrogen, and are called the non-nitrogenized class of aliments. There are, as we see, three groups of them, differing in the relative proportions of their elementary atoms. In the Sugar and Starch group, the quantity of Carbon is the same, and there are an equal number of Hydrogen and Oxygen atoms. These exist in the exact proportion to form water. In composition, therefore, this whole group, Starch, Sugar, Lignin and Gum, are simply charcoal and water. The Vegetable acids, which impart a sour flavor to fruits, are composed differently. Their Carbon is variable, their Hydrogen in small proportion, and their Oxygen in excess. The family of Fats and Oils are seen to differ from both the other groups. Their Hydrogen and Carbon is in large excess, with but little Oxygen.

6. *Non-nitrogenized or Heat-producing Compounds.*— This group of aliments is simply designed to be destroyed (burned) in the animal body for the production of heat. They are decomposed by the Oxygen of respiration into carbonic acid and water, and are hence called "elements of respiration." We see at once, from their composition, that the amount of heat



which they produce must be variable. That depends as we have seen, (2,) upon the proportion of Hydrogen and Carbon. The Fats and Oils give most heat, the Vegetable Acids least, and the starch group a medium amount. These are so distributed by nature, as to meet the wants and necessities of animals under various conditions of season and climate; as, animal oil and blubber, for the polar inhabitants; acid fruits and starches, for those within the tropics; and these variously blended, for the occupants of intermediate regions. The most diverse necessities of animal beings are thus amply and fully provided for.

7. *Nitrogenized or true Nutritive Compounds.*—The second class of alimentary principles, as we see by a glance at the diagrams, is formed from Carbonic Acid, Water, and also Ammonia; it contains Nitrogen, and is hence termed the Nitrogenized group of aliments. They are called *Vegetable Albumen*, *Vegetable Gluten*, *Vegetable Fibrin*, and *Vegetable Casein*; and, excepting a small and varying amount of Sulphur and Phosphorus—too small to be accurately determined—they are all identical in composition. The use of these alimentary compounds is, to be transformed into the fabric or tissue of the animal body; they form its structure, and are hence the only true nutritive aliments (40). Muscular Flesh has the same composition as these substances. It contains the same proportion

of nitrogen. The members of the other group (6) are incapable of being converted into muscle, or the tissue of animal flesh. Upon these facts all the ablest Physiologists are now agreed.

8. *Why are all Organized Compounds so transient?—* By reference to the chart, and comparing the composition of the aliments with substances from which they are derived, we see a marked difference of composition. The gases are simple, containing only a pair of elements, with but two, three, or four atoms. But the substances which the vegetable makes out of them are very different. They consist of three or four distinct kinds of matter, and large numbers of atoms. Their composition is complex. As a consequence of this, the former are highly permanent and unchangeable, while the latter are prone to change and decomposition. The more complicated a machine, the more easily is it thrown into disorder. So with chemical compounds; the greater the number of elements and atoms they contain, and the more numerous the attractions brought into play, the easier is their composition broken up by disturbing forces. The atoms of organic compounds are thrown as it were into a constrained state, by the forces which produce growth; slight causes are, therefore, sufficient to derange the nice equilibrium in which they are held, and they recoil back again into simpler and more permanent conditions.

9. *Organic Compounds are Reservoirs of Power, resembling Bent Springs.*—This return or relapse of atoms to the dead, mineral form, is for the production of heat, light, and power. The substances we use in lamps, grates, stoves, or under steam boilers, consist of atoms which have been thrown into a constrained state by the radiant forces of the sun. It is as if the sun had wound up the atoms into organic combination. They here resemble coiled or bent springs. When the proper impulse is communicated, their delicately adjusted affinities are overturned, and the atoms recoil, or return to the simple forms of carbonic acid and water,—the products of combustion, with the production of illuminating, heating, and mechanical effects. The spring returns with force to the relaxed state.

10. *The Philosophical idea of Foods.*—Now, alimentary substances, like all other parts of vegetation, consist of atoms which have been arranged into groups, by the action of solar light and the other imponderable agents; but they are also endowed with the capability of becoming parts of animal systems, and there, in a regulated and peculiar manner, relapsing into the decomposed or inorganic form, with the same evolution of heat and force. The great office of the animal system is thus apparent. In a philosophical point of view, it is but a mechanism for the destruction of organized matter; and foods are *that class of vegetable*

*substances which is capable of being used up in this machine WITHOUT INJURING IT.* Gunpowder recoils with vast force from the solid to the gaseous form, and although adapted to shatter a rock, or project a bullet, it would hardly perform well under a steam boiler. But wood and coal are decomposed into the gaseous condition, and impart their power under a steam boiler, although they are not capable of doing it in the animal body; this may be done by the *true aliments* alone.

11. *The recoiling atoms return to the inorganic state by different routes.*—The relapse of atoms, or their passage backward from the organized to the inorganic state, takes place under many different circumstances, and gives rise to a great variety of products. If wood, for example, is allowed to decay in contact with air and moisture, a class of substances is formed from it, of a totally different nature, termed humus, humic acid, ulmin, geine, etc. If allowed to decay under water, with total exclusion of air, as occurs in ponds and marshes, an inflammable gas is generated, with mud and peat. If heated with partial admission of air, as in coal-pits, carbonic acid, water, and charcoal are produced. If heated with entire exclusion of air (*destructive distillation*), charcoal, tar, pyroligneous acid, creosote, and illuminating gas appear. But if the wood is burned in the open air, the Oxygen

seizes upon its Carbon and Hydrogen, which return at once to the condition of carbonic acid and water, from which the wood was originally derived. In all these cases the wood itself is destroyed. The attractions that hold together its atoms, in a certain order, which constitutes it wood, are broken, and the atoms combine again in new groups, giving rise to new and various substances, which constitute the intermediate steps of the disorganizing process. The atoms may return by various routes, but always to the same simple condition of carbonic acid and water.

12. *The Nitrogenized compounds easily putrefy.*—Of all the organized products of nature, the most transient and changeable are the nitrogenized aliments. Under the influence of moisture and Oxygen, at common temperatures, they pass rapidly into putrefactive decomposition. The reason why meat, blood, dough, milk, etc., change their nature, or putrefy so speedily is because of the abundant presence of nitrogenized matter in a moist state, which favors putrefaction.

13. *Putrefaction communicated to the non-nitrogenized aliments.*—The non-nitrogenized aliments are of a more permanent nature—less liable to decay. Pure Woody Fibre, Starch and Sugar, for example, are comparatively very enduring; but, when in contact

with nitrogenized substances, which are undergoing decomposition, they become at once affected and go into the same state. The putrefactive condition passes from one class of substances to another, by a kind of infection; as a rotten apple throws a sound one in contact with it into the same state, or, as we may suppose, fire communicated from one burning body to another. It is as if the atoms in the spontaneously putrifying substance, being in a state of active commotion, communicate their own agitation to surrounding bodies, and thus overturn the delicately balanced equilibrium of their composition, establishing a new order of attractions, and giving rise to a new series of products.

14. *How Alcohol results from putrefaction.* Thus, a cause of the rapid decay of wood under certain circumstances, is the presence of Albumen in its sap. The Albumen readily putrefies and imparts its own state to the woody substance. The patent kyanizing process for preserving wood consists in throwing the Albumen of its sap into an unchangeable state. In the same manner Sugar is changed. A solution of pure Sugar in water remains for any length of time unaltered. But if a nitrogenized substance in process of decomposition, as putrefying flesh, blood, cheese, dough, or white of egg, be added to a solution of Sugar in water, a change promptly occurs, the sugar disappears,

carbonic acid is produced in large quantities, the liquid loses its sweet taste, acquires a peculiar flavor, and is found to contain a new substance called ALCOHOL.

15. *Alcohol comes only from the destruction of Sugar.*—The nitrogenized substances, which, by their putrefaction, induce decomposition in other compounds, are termed *ferments*; the process is called *fermentation*. In consequence of its common occurrence in the juice expressed from the fruit of the vine, it is called the *vinous* fermentation. It proceeds only within a certain range of temperature, from 60° to 80° of the common thermometer. Below this range, no action takes place; above it, another fermentation sets in, called the *viscous*, in which gummy and mucilaginous substances instead of Alcohol, are produced from the Sugar. All vegetable juices and other liquids containing Sugar are capable of the Vinous or Alcoholic fermentation, provided they have present, as is usually the case, sufficient albuminous matter to produce and sustain the action. Thus, the juice of apples, pears, peaches, currants, grapes, beets, carrots, parsnips, the sweet juices of the cane, corn-stalk, maple, ash, birch, butternut, palm tree, cocoanut, and numerous other fruits, roots and trees, milk, and various artificial infusions of Sugar, are capable of fermentation, and are employed as sources of Alcohol. There are several

different kinds of Sugar, although but one variety (*grape-sugar*) is capable of being converted directly into Alcohol. The other kinds must be transformed into grape-sugar, before they become susceptible of this change.

16. *How Alcohol is obtained from grain.*—But the chief source of Alcohol is the cereal grains, rye, wheat, barley and indian corn; much is also made from potatoes. Although these contain but very little Sugar, yet they consist of a large proportion of Starch, a substance which is capable of being converted into Sugar. This change is effected naturally in grain and potatoes during the process of sprouting or germination. A new substance is produced in the seed at this time, called *diastase*, which possesses the power of transforming Starch into Sugar. This principle is made available in the operation of malting. *Malt* is barley, or other grain, in which germination has been commenced, and then arrested by heat. If bruised malt be mingled with the ground meal of other grain, and water, at the proper temperature, be added, as is done in what is technically called the *mashing process*, the diastase of the malt serves to convert the additional Starch into Sugar. The sweet liquid drawn off is called the *wort*. It contains the newly formed Sugar, which may then be changed to Alcohol by the common method of fermentation.



17. *Principle of distillation.*—As Alcohol is always generated in a liquid solution of sugar, it must of course at first be mingled and diluted with a large proportion of water; its separation from this water, constitutes the process of *distillation*. The term distillation is usually employed to designate all the successive operations of malting, mashing, fermentation, and the final separation of the spirituous product; but, strictly, it applies only to the last process. The circumstance made use of in distillation is the variation in the boiling point of liquids. Alcohol boils, or is converted into vapor, at a temperature nearly forty degrees lower than that required for the boiling or vaporization of water. A heat therefore which is insufficient to convert water into steam, raises Alcohol to the vaporous state. The Alcoholic vapor is then transferred through suitable pipes into a vessel (*worm of the still*) which is surrounded with cold water;—it is here condensed into a liquid. The first product which passes over is, however, by no means pure. Alcohol has a very powerful chemical attraction for water, and retains a portion of it in combination as it passes through the vaporous condition. A second distillation reduces the proportion of water, and forms what is termed *spirits of wine*. A third distillation renders the Alcohol still stronger, forming *rectified spirits of wine*, which still contains from ten to twenty per cent. of water. This can only be entirely sepa-

rated by powerful chemical means, as the use of quick lime, or carbonate of potash, which, combining with the remaining water, leaves pure or *absolute* Alcohol. The common commercial Alcohols contain variable proportions of water, which are determined by instruments called alcoholmeters.

18. *Properties of Alcohol.*—Pure Alcohol is a colorless transparent liquid, of an agreeable fruity odor, and a penetrating burning taste. It is about one fifth lighter than water, (sp. gr. 794,) and has such a strong attraction for that substance (17) that when bottles contain it are left open, it withdraws it from the atmosphere and becomes heavier. Hence the weight, or specific gravity of a mixture, is made use of to determine the proportion of spirit it contains. It is more volatile than water, that is, it evaporates and disappears faster when exposed to the air. It has never been frozen even by a temperature 180 degrees below the zero of our common scale, and is hence adapted for use in thermometers where the cold is so great as to freeze mercury. As is shown by the diagram, Alcohol consists of four atoms of Carbon, six of Hydrogen, and two of Oxygen. It is therefore highly inflammable, and burns with a lambent blue flame, producing no smoke, or soot, and only a small amount of light, but a very intense heat. This property adapts it admirably to the wants of chemists, who burn it in lamps

as a common source of heat. In burning, its Carbon and Hydrogen combine with Oxygen, forming carbonic acid and water. It is much used as a solvent, as it dissolves many substances which water will not. It has also powerful antiseptic properties; that is, it prevents the change and putrefaction of vegetable and animal substances, when placed in it. It is therefore employed in a culinary way to preserve various fruits, and also by Physicians and Naturalists, to keep dead bodies from decomposition.

19. *Alcohol the essential ingredient in all Spirituous Liquors.*—It is to this ingredient that all spirituous liquors owe their characteristic and remarkable properties. They are distinguished from each other by the proportion of the Alcoholic element, and by peculiarities of taste, odor and color, which may either have been derived naturally from the fermented juices, or added artificially. Thus, the flavors of the numerous wines are due to the oily and ethereal aromatic substances which either existed in the grape, or were generated during fermentation. The taste of gin is imparted to it by the addition of juniper berries, and that of beer by hops. It is, however, on account of the Alcoholic constituent which they all possess in common, that they are sought and prized; to this they owe their peculiar characteristic influence upon the animal system.

So well is this understood, that the term Alcohol has come into general use as the synonyme of all kinds of Spirituous and Intoxicating Liquors. Says Dr. Beck,\* "On the effects of this poison, when taken, as it ordinarily is, by persons in habits of intoxication, it is not necessary for me to enlarge. I have only to refer to its effects in a pure state, and in large doses, and then, by comparing these results with the table published by Mr. Brande, of the quantity of Alcohol contained in various liquors, an idea may be formed of the injury, and indeed danger, to which life is so freely and generally exposed."

20. *Proportion of Alcohol in various Liquors.*—The relative amount of Alcohol in different liquors varies greatly. According to Brande, Rum, Whiskey, Brandy and Gin contain from fifty-three to fifty-seven per cent.; Port-Wine, twenty-two; Champagne, twelve; Cider, five to nine; and Beer four to six per cent.

21. *True source of Alcohol.*—We thus understand the true derivation of this substance. All Alcohol, whatever apparent form it assumes, has one origin. It comes from the destruction of sugar, and has no other source in nature. It is not a product of vegetable growth, like those substances which are created to

\* Medical Jurisprudence, vol. ii., p. 870.

form the food of man. No chemist has ever yet found it among the compounds built up by plants. The solar beam, which "reaches like the Finger of God across the abysses of space," and, in the laboratory of vegetation, takes to pieces poisonous gases and puts together their atoms in new groups, which are capable of nourishing the animal body,—this celestial force never arranged together the atoms which form Alcohol. On the contrary, it is a product of dissolution—of the wreck and disorganization of the principles of human food. It has the same origin as those malignant and fatal exhalations which constitute the genius of pestilence—the death and putrefaction of organic matter. Indeed, the same act which gives birth to Alcohol, also brings into the world a twin compound, which is one of the promptest and subtlest of all poisons—Carbonic Acid Gas.

22. *Its relationship to organic compounds.*—Alcohol is the first term in a series of decompositions, of descending changes which have for their object the restoration of living matter to the mineral, unorganized state. This will be at once seen by reference to the preceding Chart. The attractions among the elements of the sugar-atom are overturned; new and simpler attractions are established; about one-half, by weight, of the sugar, assumes the form of Alcohol, and the other half reverts at once to the condition of Carbonic

Acid—is thrown back into the world of dead unorganized matter in the form of a fatal poison to animals, and fitted again to become food for growing vegetation. The forces of growth and construction end with the production of the saccharine aliment. The Dynamics of dissolution are then brought into play, forming Carbonic Acid and Alcohol as their first effect. Under various circumstances the Alcohol may be decomposed, giving rise to numerous other compounds. If Sulphuric Acid, in certain proportions, is added to it, the Alcohol changes, as is seen in the diagram, the Sulphuric Acid attracts away from it the elements of one atom of water, and thus converts it into *Ether*. If an atom of water is taken from the *Ether*, (see the diagram,) or if two had been removed from Alcohol, Olefiant gas, the illuminating gas of cities, results. In the final stage we have the olefiant gas decomposed by atmospheric Oxygen, in burning, and resolved into water and Carbonic Acid. All the atoms of the organized compound have thus relapsed, by successive stages, to the mineral or quiescent state.

23. *Upon what the properties of Organized Compounds depend.*—It will be seen, by referring to the diagram, that Alcohol and Ether consist of the same chemical elements as sugar; but we must guard against the error of supposing that they are consequently similar in properties. All organized substances consist main-

ly of the same three or four elements. Yet how infinitely diverse are they in properties. These properties depend less upon what they are composed of, than upon the *proportions* of their elements, or the *way they are grouped*. So delicately are organic substances constituted, that we have but, as it were, to jar or jostle the arrangement of their atoms, in the slightest degree, and we destroy one and form another. Chemistry abounds in illustrations of this truth. The atmosphere, which is the vital sustainer of all animal life, consists of Oxygen and Nitrogen gases mixed in *certain proportions*. Now, if we combine these gases in *different proportions*, they would give rise, in one case, to exhilarating gas, which would madden all animals that should respire it; and, in other proportions, they would condense into a liquid ocean of *Aquafortis*.

24. *Alcohol has no existence in Grains or Food.* We have not the shadow of a warrant for assuming that Alcohol exists, as such, in sugar, and, consequently, as is sometimes said, in grain. The production of Alcohol involves the destruction of one compound and the creation of another. Oxalic acid, ether, olefiant gas and a hundred other compounds, may be derived from the elements of sugar, but do these various substances therefore exist in the sugar? Such an idea is but the nakedest assumption; and besides, it would

confound the distinction between all organic substances, for they universally consist, as we have repeatedly seen, of precisely the same three or four elements. The properties of Organized Compounds depend upon the infinitely various *proportions* and *groupings* of their constituent atoms.

NOTE.—For fuller information concerning the Chemistry of organized bodies, the reader is referred to the Author's Class-Book of Chemistry, published by D. Appleton & Co., New York.



## EFFECTS UPON THE HUMAN SYSTEM.

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### II. INFLUENCE OF ALCOHOL UPON THE DIGESTIVE PROCESS.

25. *Is alcohol digested?*—When liquors containing Alcohol are drank, and enter the stomach, they do not remain there to be digested like solid food; nor do they pass into the intestines to enter the circulation by the common route of alimentary substances. They are taken up, or absorbed, at once, in the same way as water, by the veins of the stomach, and are then carried forward into larger vessels, and thus mingle directly with the mass of the blood. Dr. Percy made numerous experiments upon the lower animals, by injecting strong Alcohol into the stomach, and thus poisoning them to death. Upon a subsequent examination, if not too long delayed, he was always able to detect Alcohol in the blood of the poisoned animal. The speed with which this result is brought about, can be explained in no other way than by the direct and rapid absorption of the Alcohol. In one of Dr. Percy's experiments, in which the animal fell lifeless to the ground the moment the injection of Alcohol

into the stomach was completed, the pulsations of the heart entirely ceased within two minutes, and the stomach was found nearly void, while the blood was strongly impregnated with Alcohol. More recently, also, Alcohol has been actually detected in the veins of the stomach, (gastric veins,) by two eminent French Physiologists, M. M. Bouchardat and Sandras (*Carpenter*).\*

26. *Can Alcohol aid the stomach in the act of digestion?* There is a prevalent belief that Alcohol is capable of so acting upon the stomach as to assist digestion. But a very slight acquaintance with the conditions under which this function is carried forward, will satisfy us that such action is impossible. Stomach digestion is carried on by a fluid, called the gastric juice, which is secreted from the inner membrane or wall of the organ. The solvent or digestive power of this fluid over food is due to two different kinds of substances which it contains. The one is an acid,—it may be Chlorohydric, Acetic, or Lactic—and imparts an acidulous character to the digestive operations of the stomach. The other substance essential to digestion, is a peculiar organic principle called *Pepsin*. This is a nitrogenized compound which exists dissolved in the gastric juice, and is supposed by Liebig, to be of the nature of a ferment. It is known that this substance is indispensable to digestion, but its na-

\* See Dr. Percy's experimental researches, p. 61.

ture and properties are not so well understood. Chemists prepare it, by adding Alcohol to the gastric fluid, *which precipitates the Pepsin*. Alcohol throws down Pepsin from its soluble active form, to the solid inert condition. Taken into the stomach then, Alcohol, so long as it remains there, must be a prompt and powerful antagonist of the digestive process. These statements are explicitly corroborated by the latest and highest physiological authority. Say Todd and Bowman, "The use of Alcoholic stimulants also, retards digestion, by coagulating the Pepsin, and thereby interfering with its action. Were it not that wine and spirits are rapidly absorbed, the introduction of these into the stomach *in any quantity* would be a complete bar to the digestion of the food, as the Pepsin would be precipitated from solution as quickly as it was secreted by the stomach."\*

27. Having entered the torrent of the circulation, the Alcohol is quickly brought into the presence of every part of the system. It speeds through heart, lungs, liver, and brain, penetrates every organ, traverses all tissues, and leaves no part unvisited. What, then, are the effects produced by this universal contact? Let us first inquire concerning the relation of alcohol to each of the great leading constituents of the animal tissues as shown by experiment.

\* Todd and Bowman's Physiology of Man. Part 4, p. 210. 1852.

## III. RELATION OF ALCOHOL TO THE CONSTITUENTS OF THE TISSUES.—WATER.

28. *Design of the Animal System.*—The complete animal structure has been contrived and adapted for the accomplishment of a single purpose. The muscular and nervous systems are most immediately engaged in bringing about the result, but all parts contribute more or less directly to this grand end—the reception and transmission, the development and manifestation of power.

29. *Fundamental condition of the exercise of Force.*—Now, it is an established law in the economy of living beings, that the production of force is always attended by waste of matter. Every act involves a partial destruction of the vital instrument engaged in its performance. Living machines, as well as inanimate ones, wear by use. With the birth of power, there is death of living matter. Every contraction of a muscle, every transit of the nervous influence is accompanied by the passage of the living atoms of muscle and nerve into the condition of death. Every action of mind upon the nervous system disintegrates or breaks down a portion of nervous matter, just as every train sent over a railroad wears away some portion of the iron

track. In the action of the surrounding universe upon the living conscious being by which impressions are poured in upon the mind through the channels of sense, and in the reaction of the potential soul upon that universe, there are incessant changes in the position and relationship of chemical atoms—changes of atoms from the organized to the mineral state—from life to death.

30. *The products of waste must be removed from the system.*—The atoms that thus perish in the body cannot be used over again. They become at once noxious to the system, and if suffered to accumulate, they clog and poison it, inducing disease and death. The atoms of carbonic acid formed throughout the human body, by natural decay and decomposition, if retained within it for five minutes, would cause death. The liquid and gaseous products of waste and wear must hence be promptly and continuously removed.

31. *What is nutrition?* But other than destructive changes go on within the body; if left entirely to these, the vital energies would be speedily broken down, and the fabric itself consumed. The maintenance of health and vigor requires the constant renewal of the failing muscular and nervous tissues. To effect this purpose, we use food, which is a kind of matter so prepared by the hand of Nature that it is capable of

taking the place of the dying atoms (10). This constant supply of new substance, which replaces the particles that have perished, is termed nutrition.

32. *The living animal a theatre of rapid internal changes.*—We gather from these facts that the animal fabric is a theatre of unceasing changes. The unalterable condition of its perpetuity is decay and renovation, by which material atoms are thrown into movement and transported from place to place. Through innumerable channels the nutrient matter is distributed to all parts and the products of decomposition are gathered up and cast away. Several pounds of waste matter are expelled from the system each day, and an equal amount of nourishing material sent to take its place. Of air, water, and food, it is estimated that an adult man consumes upward of three thousand pounds weight in a year.

33. *Water the great vehicle of vital changes.*—We thus see that great freedom of motion, among its chemical constituents, is indispensable to the living system. It is impossible that the body should be composed wholly or chiefly of solids, and hence we find that much the larger part of it exists in the liquid form. The medium that Creative Wisdom has prepared to conduct the vital changes of living beings is WATER.

34. *Importance of Water in the animal economy.*—The presence of this liquid is essential to all life; it is a leading constituent of every organized substance. From the lowest condition in which vitality is manifested to the highest, from the humblest moss clinging to the surface of a naked rock, upward through all the gradations of vegetable and animal life to man at the summit of the scale, every living being requires a copious and constant supply of water to maintain the vital functions. Four-fifths of the blood and three-fourths of the brain, muscles, nerves, and tissues of all organs that make up the apparently solid flesh, consist of water. It is the vehicle of all change, the great transporter of the organized world. It courses through the animal system along countless channels, and with almost immeasurable velocity; it is the chief agent of digestion, absorption, nutrition, secretion, and all the wonderful transmutations which take place perpetually in the vital structure.

35. *Magnitude of the demand and supply of Water.*—Our first physical necessity is for air to breathe; the second, is for water to drink. So large and continual is the demand for it that a healthy man consumes three-quarters of a ton annually; three hundred times his own weight when he has arrived at the period of manhood. So immense a consumption requires a corresponding supply; and accordingly, we find that the

provision of this liquid in the economy of nature, is on a scale proportional to its importance. It is the most abundant of all known material substances. Its reservoirs are miles in depth, and cover three-fourths of the globe. Through the action of physical forces it is raised in vapor, and borne away by atmospheric currents, falls condensed upon the land—a process of regular natural distillation. The direction and extent of these atmospheric currents, laden with water, determine the distribution of living beings upon the earth. Where there is abundance of water, there life is exuberant; but where it is withheld, we find the desert.

36. *Adaptation of Water to the needs of the system.*—When we reflect upon the properties of this substance, the plenitude of its supply, the vastness of the plan of operations by which it is purified and furnished to the inhabitants of the land; when we observe in what a wonderful degree it is adapted to the grand offices it is designed to perform in the scheme of the living world; its perfect liquidity within a considerable range of temperature; its neutral and passive attributes; its wide range of solvent powers by which it changes its nature and acquires the qualities of a thousand different substances; when we consider how admirably it is fitted to carry forward that uninterrupted series of mutations, those subtle and exquisite changes which characterize the animal organism, we



are hardly able to resist the thought, that, in the order of Providence, Water was created first, and that the whole plan and policy of organized nature was adapted and conformed to its properties. •

37. *Alcohol has a powerful attraction for animal tissues.*—The constituent water of flesh is held in combination with it by a certain amount of chemical or capillary attraction. Any agent or force which disturbs the natural equilibrium of this attraction, tends to produce disorganization. When Alcohol is brought into contact with animal membrane or flesh, it is at once absorbed, penetrating and diffusing itself throughout all parts of the tissue. It seizes upon membranes with a powerful affinity. Dr. Percy\* found that, in case of animals poisoned by swallowing strong Alcohol, the coats of the stomach retained it after long washing and soaking; nor did a jet of water directed upon it for some time avail to remove it.

38. *Relation of Alcohol to the Water of tissues—Liebig's experiment.*—Now, the Alcohol in this case acts as a disorganizing agent. It acts destructively upon the part which it enters, by altering its normal constitution. This has been demonstrated by Liebig. That consummate Experimenter took one hundred and forty-one grains of fresh animal membrane, which con-

\* Experimental Inquiry concerning the presence of Alcohol in the ventricles of the brain, p. 29.

tained thirty-four grains of dry substance and one hundred and seven grains of water, and soaked it for a time in about two and a half cubic inches of Alcohol. When removed, the membrane was found to contain thirty-two grains of Alcohol, and to have lost ninety-nine grains of water. "For one volume of Alcohol, therefore, retained by the membrane," says Liebig, "rather more than three volumes of water have been expelled from it." "Since, in this case," he continues, "so much more water has been expelled than of Alcohol absorbed, the first result must be a shrinking of the animal substance.\* This form of its disorganizing action, "depletion of the tissues," as it is termed, is also recognized in accounting for the physiological and medicinal effects of Alcohol, by our standard authority in *Materia Medica*.†

#### IV. RELATION OF ALCOHOL TO THE CONSTITUENTS OF THE TISSUES.—ALBUMEN.

39. *Albuminous principles of Food*.—The food which we daily consume is composed of several alimentary principles, variously compounded; one of these is known as the *Albuminous*. It comprises the muscular or lean parts of meat, (*Fibrin*), the curd of cheese, (*Case-*

\* Liebig's *Researches on the Chemistry of food and the motion of the juices in the animal body*. P. 137.

† *Pereira's Materia Medica*, Vol. I., p.p. 142, 144; 3d Am. Ed. 1852.

in), the sticky, adhesive portion of the flour of grain, (*Gluten*), and the white of eggs, (*Albumen*). Their chemical composition has been noticed (7); see also the diagrams. They are the same whether derived from the vegetable or animal kingdom.

40. *The Nutritive principles are converted into Albumen in the body.*—Organic chemistry has recently proved, to the satisfaction of Physiologists, that the *structure* of the animal body, all its fibrous and vascular parts, its muscular, nervous and cellular tissue, are directly and entirely derived from the Albuminous portions of food. By digestion, they are all dissolved and thrown into the form of Albumen, which is a liquid. This liquid then passes along the appointed route, enters the general circulation, and of course, is carried to all parts of the system. Albumen is found in all organs, in the brain and nerves, the liver, kidneys, spleen, pancreas, and all glands, in the peculiar juices which pervade the flesh, and is a large and constant ingredient of the blood of all animals.

41. *Albumen is transformed into Fibrin.*—Under the influence of the heat generated within the body, and of respired Oxygen gas, the vital element of the air, the Albumen of the body undergoes a change—a change of form only; it is transformed into Fibrin. Fibrin is that principle of the blood which clots when with-

drawn from the body. It is a thready, stringy, fibrous substance; it is Albumen so altered as to possess these properties. It exists at first in the blood in a soluble or liquid condition, but when taken away it quickly coagulates, clots, or is precipitated, and separates as solid Fibrin. The same thing constantly occurs within the body; the Fibrin coagulates, separates, and is deposited as flesh. These changes have been aptly compared to the spinning and weaving of cotton. The albumen resembles raw cotton; it is spun in the system into thready Fibrin, and that is woven into the various tissues of flesh, Oxygen gas being the motive power of the factory. The transformation, distribution and deposition of these substances is called *nutrition*.

42. *Value of Albumen in Animal Organisms.*—We thus see how important is the part which Albumen plays in the vital economy. Every where throughout organized nature, we find the phenomena of life dependent upon its presence. It is the starting point of all growth, the foundation material from which all tissues are renewed, and the whole animal structure elaborated. This becomes most obvious when we contemplate what occurs in a fowl's egg. The contents of the egg are simply Albumen and Water. By the heat of incubation, and the presence of Oxygen, which enters through the porous shell, (the same conditions, therefore, which we have in the animal body by respiration,) all parts

of the young chicken, flesh, blood, membranes, nerves, tendons, blood vessels, cells, feathers, and claws, are produced; and bones, also, with the aid of lime from the shell. The elements of all these organs which now possess form and vitality, before incubation, were simply elements of Albumen. It is therefore in this case, as well as in that of higher animals, the plastic source of all the bodily structures.

43. *Alcohol incapable of nourishing the body.*—From these considerations, it will be seen at once that Alcohol is unable to aid in the nutrition of the body. It cannot be transformed into tissue; none but Albuminous aliments can be thus changed. Its chemical composition, as we see by the diagram, forbids it, for Alcohol contains no Nitrogen, while all animal tissues abound in it. The body can no more make or repair muscle or fibre with Alcohol, than a mechanic can make gold out of iron. It involves the transmutation of chemical elements, which is an impossibility. As Alcohol cannot nourish the wearing and wasting tissues, it therefore has no power to renew the declining strength, or restore the over-fatigued and prostrate system. When taken for this purpose, it accomplishes a far different thing (66-68); and he who depends upon it cheats himself. For the formal demonstration of the principles of Alimentation here assumed, and now

universally accepted, the enquiring reader is referred to the writings of Mülder and Liebig.

44. *Effect of heat upon Albumen.*—The action of heat impresses a peculiar change upon Albumen, as is seen in boiling an egg. From a transparent, glairy liquid, heat alters it to an opaque, white, brittle solid. 165° of heat is sufficient to do this; so that if from any cause the temperature of the globe should be elevated to this point, the Albumen of all living organisms would become solidified, the blood and vital fluids curdled, and all life would cease.

45. *Influence of Alcohol upon Albumen.*—The effect of Alcohol upon Albumen, is the same as excess of heat; it coagulates it, throws it from the liquid to the solid state, as may be at any time seen by mingling it with white of egg. This is one of the modes of action by which Alcohol destroys life, when taken in excessive quantity, or in a concentrated form. I quote the highest and most recent chemical authority to this point.\* “Concentrated Alcohol acts as a poison on the animal economy, and will produce death, when taken in large quantities. Injected into the veins, it produces almost sudden death, *by coagulating the Albumen of the blood.*”

\* Regnault's Chemistry, Vol. ii., p. 515, 1852.

46. *Its influence in small quantities.*—Now, in the ordinary use of Alcoholic drinks, there is not sufficient taken to produce this result, namely, coagulation of the Albumen of the vital fluids, and, consequently, death. But this affords us no warrant for assuming that the lesser quantity is neutral or inactive. It enters the blood, and circulates through the system as Alcohol, retaining all its properties and powers; and just to that extent in which it is present, it must exert an unhealthy abnormal influence upon Albumen. It must tend to harden and solidify it, and, therefore, operate powerfully to impede its vital transformation into Fibrin, an essential step in the nutritive process.

47. *Alcohol obstructs the nutritive and reparative functions.*—It has been observed by experimenters, that where animals are poisoned by Alcohol, the blood, after death, either remains in a fluid state, or is very imperfectly coagulated. The fibrin continues in a fluid condition, precisely as when an animal has been killed by lightning, or suffocated with Carbonic Acid Gas. This two-fold action of Alcohol upon the leading constituents of the blood, first retarding the transformation of Albumen into Fibrin, and then obstructing the coagulation of the Fibrin, must inevitably depress the plastic powers of the blood, and greatly disturb the nutritive operations. This result is in full accordance with observed facts, and the highest medical

testimony. Of the British army in India, some regiments practiced total abstinence, and others made use of the spirit ration. The commanding officers reported, that so far as regards recovery from sabre-gashes, sword-cuts, and gunshot wounds, the restoration was more prompt, and fewer cases terminated fatally, in the total-abstinence regiments, than in the others. So, also, in surgical practice, it is well known, that experienced operators are much more hesitant about undertaking formidable cases, when the patient has been addicted to the free use of Alcoholic drinks, than in other instances, the nutritive and reparative powers being too low.\*

48. *Practical recognition of these principles.*—In the case of individuals trained for prize-fights, by the best managers, precisely the opposite condition is remarked. The body recovers with wonderful facility from

\* Says DR. J. N. CARNOCHAN, a distinguished practical surgeon, and Professor in one of the New York Medical Colleges, in a letter which appeared in the TRIBUNE of Oct. 26, 1853: "As a surgeon, however, having vast opportunities of experience, in hospital and private practice, I must declare that I always look upon patients who have been in the habit of using spirituous beverages, as least likely to recover from serious maladies, or from the shock following capital operations; and, also, as those most likely to require longer time for the cure of diseases of a more simple character. I have, at times, met with cases of fracture of the bones, occurring in persons of intemperate habits, in whom the bones would not unite by bony material, but remained flexible and useless, on account of the union being ligamentous."



the effects of injuries,—wounds heal rapidly. The best systems of training involve three essential points: first, the requisite amount of exercise; second, a proper diet, chiefly lean meat and stale bread; and third, ABSTINENCE FROM THE USE OF FERMENTED OR ALCOHOLIC LIQUORS! \*

#### V. EFFECT OF ALCOHOL UPON THE RESPIRATION AND CIRCULATION.

49. *Action of respired gas upon the system.*—The gases that we breathe take entire control of the system, physical and intellectual. Their command over the life-forces is absolute. Thus, if we breathe an atmosphere of pure carbonic acid, the vital machinery stops instantaneously, and forever. If we inhale the same gas, much diluted with air, the powers of the system are clogged and depressed. Breathe the vapor of sulphuric ether, or chloroform, and the instruments of sensation are temporarily locked in the paralysis of death, and “we enter a world where there is no more pain.” Inhale nitrous oxide, and the wheels of life spin with preternatural velocity, the muscular powers are augmented, intellection is intensified, the brain whirls in a vortex of excitement, and, as has been beautifully said, a man lives a year in a minute, and that minute is in the seventh heaven. But

\* See Carpenter's Human Physiology, p. 483.

if we respire common air in its natural proportions, we have a rate of action in the system, a series of regulated changes and transformations which we term health of body and sanity of mind. The cause of these remarkable effects is, that the respiratory mechanism opens directly to the blood, and the gaseous agent which enters it, gains immediate access to all parts of the system, diffuses through every organ, and penetrates and saturates the entire body.

50. *Importance of the respiratory process.*—The first physical necessity of animated beings is, for air to respire, and the active principle of air is Oxygen gas (2.) The introduction of this substance into the bodily system is the fundamental event of animal life; all other physiological operations are subordinate to this, and depend upon it. We eat, digest, and assimilate food only that it may finally minister to the respiratory process—may be disorganized and destroyed by Oxygen. It impels the normal changes of the system, (28-32,) in which health consists. It sustains the whole by destroying the parts, and is thus the great motor of animal vitality.

51. *Action of Oxygen within the system.*—If we in any manner touch the relation of Oxygen gas to the living system, the vital machinery is at once deranged. If by Providential interference, the chemical powers of

this wonderful substance should be either augmented or depressed, or if its relative proportion in the atmosphere should be materially increased or diminished, the universal destruction of living races would be the inevitable consequence. We witness the baneful effects of reducing its natural quantity, in the air of confined and unventilated apartments, which is charged with physiological mischief of the most serious nature. There is an adjustment of exquisite harmony between the chemical energy or affinity of Oxygen, and the chemical composition of those compounds which form the animal body. In breathing Nitrous Oxide, (laughing gas,) which is extremely soluble in the blood, we overcharge the system with Oxygen, and there is, at once, preternatural excitement. The muscular system is quickened to unwonted activity, the brain is over-stimulated, reason prostrated, and the mind goes delirious. These are all simply the result of heightened combustion throughout the body. It is precisely like driving a powerful blast of wind upon a conflagration, arousing it to augmented fury.

52. *Effect of increasing the combustibility of the constituents of the body.*—But the same result may be effected in another way. If, instead of supplying to the system an extra charge of Oxygen, we, on the other hand, alter the constituents of the body, and endow

them with a higher attraction for this gas, we shall have the same augmented combustion, abnormal excitement, and over-stimulation. Instead of an extra supply of Oxygen, what there is, is seized upon with greater avidity, and the same disturbance of equilibrium and intensification of both intellectual and physical action is the consequence. These effects are produced by the presence of Alcohol in the system.

53. *Relations of Alcohol and Oxygen.*—The relations of Alcohol to Oxygen, the vital sustainer of animal life, are totally different from those compounds which constitute our natural food. Its attractions for this gas are more powerful than those of any alimentary substance. Predominance of Nitrogen in food imparts to it low combustibility; that is, weakens its attractions for Oxygen. Predominance of Carbon greatly increases its combustive attractions, and predominance of Hydrogen augments this property in a pre-eminent degree. It will now be seen, by reference to the chart of diagrams, that the Protein compounds stand lowest in this relation, and the Fats and Oils highest; and these, it is well known, are the most inflammatory and stimulating of all dietary compounds. Now, by glancing at the composition of Alcohol, it will be observed, that it takes a much higher rank as a combustible than even the Oils and Fats. Like them, it contains no Nitrogen, abounds in Carbon, and con-

tains a great excess of Hydrogen. There are as many atoms of Hydrogen, as of both its other elements put together. In the Fats and Oils, the proportion of Hydrogen does not even equal that of Carbon; but Alcohol contains of Hydrogen half as many again atoms as of Carbon. Now, the reader need hardly be reminded that Hydrogen (2) is the leading fiery ingredient of organic compounds. It attracts Oxygen with intense energy, and we generate the highest artificial heat by burning these gases together by means of the oxy-hydrogen blowpipe.

54. *Conditions of Physiological Harmony.*—The Creator of these “fearful and wonderful” organisms has graduated, with omniscient exactness, the reciprocal powers and affinities of the gases we inhale and the food we digest. Their rate of reaction constitutes the equilibrium of health, and no substance, widely different from those appointed by God for the purpose, can be substituted without prompt and serious disorder. Science would predict that a compound of this nature introduced into the living body, especially if it were of a diffusible nature like Alcohol, would not behave as a true dietary principle, but as a disturber of the physiological harmonies, a quickener and provocative of all the functions, a swift and fiery stimulant. And this accords with universal experience.

55. *Effects of Alcohol upon the General System.*—When Alcoholic liquors are taken in sufficient quantity to produce their peculiar results, the first effect we notice is an increase in the speed with which the blood flows through the system. This is shown by the increased force and rapidity with which the heart beats, and by the fuller, stronger and more frequent pulse. With this, there seems to be a general exaltation of the functions of the body. The appetite is sharpened and the secretions augmented, especially those of the skin and kidneys. The brain is also affected; for there is all the evidence of mental and emotive disturbance, such as unusual talkativeness, rapidity and variety of thought, exhilaration of the spirits, animation of the features and gestures, flushed countenance, and suffusion of the eyes. In short, all the vital functions are moving at an accelerated rate. If more liquor be taken, the excitement is heightened, rising into complete perversion of all the powers, intellectual and corporeal. The mind becomes confused and oblivious, the eyes are vacant or glazed, the voice is thick, and the muscular movements tremulous and unsteady. In the profounder stages of intoxication, the action of the mind is completely broken down, and the individual falls into a heavy torpid slumber, from which it may be difficult or impossible to arouse him. This train of phenomena, variously modified in different instances, constitutes the out-

ward and visible marks of progressive drunkenness, and it is accompanied by certain demonstrated internal effects, involving the respiratory and circulatory processes.

56. *Chemical changes of the circulation.*—Circulation and respiration are reciprocal and mutually dependent functions. The current of blood pours rapidly through the lungs to meet there, and become loaded or charged with, Oxygen gas. It then flows away with its vital burden to all parts of the system, distributing and parting with its Oxygen to afford the natural stimulus of health and activity. It now moves through a system of blood vessels called arteries, is of a bright red color, and known as Arterial or Oxygenated blood. The Oxygen is lost by combining with Carbon, Hydrogen, Sulphur and Phosphorus, which it meets everywhere. The products thus formed are taken up by the blood to be removed from the system. The compounds of Sulphur, Phosphorus and Nitrogen, are strained off by the kidneys, and rejected through that channel. The compounds of Hydrogen and Carbon, Water and Carbonic Acid, (see diagram), are expelled, partially through the pores of the skin, but chiefly through the lungs. The blood that returns to the lungs passes along the system of blood-vessels called veins; it is of a dark purple color, and is termed venous or carbonated blood. The change, or manu-

facture, as it were, of Venous out of Arterial, or Carbonated out of Oxygenated blood, takes place in all the extremely minute (capillary) blood-vessels of the body, and is the grand healthful transformation of the living economy.

57. *Alcohol prevents the natural changes which go on in the blood.*—When Arterial blood is withdrawn from the body, and Alcohol mingled with it, the florid color disappears, it becomes darkened, and at once changed to Carbonated or Venous blood. Bouchardat of France, a very skilful Physiological Experimenter, found that when Alcohol is introduced into the system in excess, that the blood in the Arteries presents the Venous aspect. Liebig observes, that “by the use of Alcohol a limit must rapidly be put to the change of matter in certain parts of the body. The Oxygen of the Arterial blood which, in the absence of the Alcohol, would have combined with the matter of the tissues, or with that formed by the metamorphosis of the tissues, now combines with the elements of Alcohol. *The Arterial blood becomes Venous without the substance of the muscles having taken any share in the transformation.*” That is, the presence of Alcohol in the blood puts a stop to the natural changes which characterize health, frustrates them by consuming the Oxygen which they require, and thus defeats the prime purpose of respiration, and of course disorders, to a greater



or less degree, all the functions of the system which depend upon it.

58. *Antiseptic action of Alcohol in the System.*—Although Alcohol is more combustibile than any of the natural constituents of the body, and will, consequently, itself change first, yet it possesses a remarkable power of hindering or obstructing changes in other substances with which it may be in contact. Thus fruits, as every one knows, are prevented from decay and change by being immersed in spirits, which are mixtures of Alcohol and water. The Alcohol prevents decomposition or alteration. So also the bodies, limbs, and organs of animals are prevented from putrefying or changing, if surrounded by a mixture of Alcohol. This power is called *antiseptic*, or decay-opposing. Now, as the changes which constantly go on in the living healthy system are of precisely the same nature as the putrefactions and decompositions which supervene after death, and differ only in being regulated, and in the steady removal of their products from the system, the inference is inevitable that Alcohol in the living system, so long as its presence continues there, produces this effect—acts antiseptically to check the proper transformations of the body.

59. *It impedes the liberation of Carbonic Acid.*—Furthermore, Alcohol has an injurious action upon the system, by preventing or retarding the escape of the

products of waste. Dr. Prout, an English Experimenter of the highest physiological authority, states that Alcohol, and all the liquors containing it, which he had tried, have the remarkable power of diminishing the quantity of Carbonic Acid Gas in the expired air, or that thrown out of the lungs, much more than any thing else which he had made the subject of experiment. He found the effect most decided when the liquor was taken upon an empty stomach, the very time it is usually resorted to, to quicken the appetite. Vierordt, another scientific authority of the highest rank, fully confirms Dr. Prout's observations, having found that, in four experiments, the per centage of Carbonic Acid fell, after from half to a whole bottle of wine had been taken, and the effects lasted from one to two hours. It is well known, that after a full meal, the quantity of Carbonic Acid expired is greater than usual; but Vierordt found that when he drank wine with his dinner, the usual per centage of expired Carbonic Acid did not take place. Dr. Prout also observed, that no sooner had the effects of the Alcohol passed off than the amount of Carbonic Acid *rose much above the normal standard*, thus proving its previous unnatural retention in the system.

## VI.—ALCOHOL AS A HEAT-PRODUCING AGENT.

60. As certain parts of food, namely, the non-nitrogenized alimentary principles, seem to be devoted in the body to the production of heat, (calorification), a claim has been set up on this score for Alcohol to take rank as an alimentary principle. High authorities have lent a dubious sanction to this view, but evidently out of deference more to custom than science.

61. *Alcohol not a true Respiratory Aliment.*—If the facts upon which this doctrine has been too hastily built be conceded to the utmost, they yet furnish no just foundation for it. We may admit that Alcohol is burned in the Human System, and that this combustion produces heat, but that is not the point. The question is, has Alcohol been endowed with such properties, that it may be burned in the organism without injury, in the same manner as those heat producing compounds which are formed by nature in plants, and which exist in all healthy food? We are not to stop with the simple inquiry, will Alcohol produce heat? we must ask is it a proper, healthful, natural source of heat. M. Milne-Edwards injected Phosphorus, dissolved in oil, into the veins of an animal, and it was soon seen to escape in the expired breath as a

white vapor—Phosphoric Acid—burnt Phosphorus. This terrific poison is thus capable of producing animal heat; but is it, therefore, a proper heat-evolving substance? To take rank as a respiratory aliment, it must be shown that Alcohol, like the other bland and normal compounds of nature, can minister to this process *without otherwise injuring the system*. But the whole current of evidence presented in this work shows the contrary to be the fact.

62. *Alcohol does not protect the system against cold.*—So far from being superior, or in any manner equal to the non-nitrogenized principles of diet as an efficient protection against cold, Alcohol falls very far below them; indeed, it cannot perform their work, and hence has no shadow of claim to be ranked among them. The combustive aliments, when taken into the system, occasion no disturbance, but are consumed gradually and give out their heat steadily, thus producing an *equal* and *sustained* result, which lasts through several hours, or until more food be required. Alcohol, on the contrary, when taken, creates an immediate excitement. It kindles a temporary glow in the system by over-stimulating it, and by robbing the coming hours of the vital energy which is their due. It thus, instead of really fortifying the body against extreme cold, actually weakens and breaks down its natural power of resistance. Those who employ it, therefore,

cannot expect to be able to withstand severe cold as effectually as those who do not. A volume of testimony, if we had space, might be cited to establish this principle.

63. *Testimony and Facts.*—The Parrys and the the Rosses, the Scoresbys and the Richardsons, Naval Commanders, who have wintered crews in high polar latitudes, and therefore in the extremest perils of cold, bear a uniform and emphatic testimony against the use of Alcohol as a heat-producing beverage in these circumstances. “In 1619, the crew of a Danish ship of 60 men, well supplied with provision and ardent spirit, attempted to pass the winter at Honduras Bay, but *fifty-eight* of them died before spring; while, in the case of an English crew of twenty-two men, in the same circumstances, but destitute of distilled spirit, only *two* died. In another instance, of eight Englishmen, also without spirituous liquors, who wintered in the same Bay, the whole survived, and returned to England; and four Russians, left without ardent spirits or provisions in Spitzbergen, lived for a period of six years, and were at length restored to their country. In the winter of 1796, a vessel was wrecked on an island off the coast of Massachusetts; there were seven persons on board; it was night; five of them resolved to quit the wreck and seek shelter on shore. To prepare for the attempt, four of them drank

freely of spirits, the fifth would drink none. They all leaped into the water; one was drowned before he reached the shore; the other four came to land, and, in a deep snow and piercing cold, directed their steps to a distant light. All that drank spirit failed and stopped, and froze one after another. The man that drank none reached the house, and about two years ago was still alive.”\*

## VII. ALCOHOL AS A STIMULANT.

64. *It causes Irritation and Inflammation.*—Besides these clearly determined chemical effects, Alcohol also exerts a potent action upon what are called the *vital* few passages upon this point from the excellent work of Dr. Carpenter.† “When Alcoholic liquids are applied to living tissues, especially to the vascular surface of the skin or mucous membrane, they induce redness, heat and pain, indicating an increased determination of blood to the part. These symptoms vary in intensity according to the state of concentration of the liquid and the length of time during which it remains in contact with the surface, and they may pass on from this condition of *irritation* to one of actual *inflammation*.”

\* Bacchus, p. 340.

† Use and Abuse of Alcohol, p. 5-7.

65. "Our best knowledge, however, of the influence of Alcohol upon the vital actions of the Animal tissues is derived from microscopic observations upon the circulation of blood in the web of the Frog's foot. If Alcohol be applied to this membrane in a *very dilute* state, its first effect is to quicken the movement of blood through the vessels, which are at the same time rather contracted than dilated. But this state of things gradually gives place to the opposite; for, after a time, which varies with the degree of dilution of the Alcohol, the circulation becomes retarded and the vessels dilated, and a further time elapses before the original condition is recovered. If the Alcohol have been applied at first, however, in a less dilute form, the first stage is not observed, but a retardation of the flow of blood is immediately brought about and a considerable dilation of the vessels takes place. The retardation may be such as to amount in some parts to a complete stagnation; and here it is noticed that the red-corpuscles, (blood globules,) become crowded together, and that their natural form is lost; their coloring matter also being diffused through the liquor sanguinis (liquid in which they swim). Around the parts in which the stagnation is witnessed, however, there is generally a border in which the blood flows with increased rapidity. Now this perverted state may gradually give place to the natural condition, if the stimulus be only applied for a short time; but if

the contact of concentrated Alcohol be prolonged, it becomes obvious that the tissue has been killed; for the circulation is never re-established in it, and it is at last separated by gangrene, (death of the part.) We rarely witness inflammation in cold-blooded animals; but this process is liable to be excited in man and warm-blooded animals, by the contact of Alcoholic fluids with living tissues, if the contact be sufficiently prolonged and the Alcohol sufficiently concentrated."

66. *Alcohol not a tonic.*—"Now the inference to be drawn from the preceding details is this, that Alcohol, when applied to the living tissues *exalts* for a time their vital activity, but that this exaltation is temporary only, and is followed by a corresponding *depression*. And further, that when the Alcohol is in a state of sufficient concentration to act more potentially, its exhausting or depressing effect is manifested without any previous stage of excitement. This inference is in precise accordance with that to which we are conducted by observation of the effects of Alcohol upon the system at large; and we are justified, therefore, in regarding Alcohol as belonging to the class of *stimulants*, and as subject to the laws of their operation. It has been affirmed by some that Alcohol in small doses is tonic, (strength or vigor-imparting,) but of this there is no adequate proof. The property of



tonic remedies is to increase the vital contractility of the animal solids in general, but more especially that of the walls of the blood vessels. Now although some slight effect of this kind is at first manifested after the application of very dilute Alcohol to a living membrane, yet it is very transitory, and is succeeded by a much longer period of *diminution* of the tonic contractility of the walls of the blood vessels. The supposed tonic properties of Alcohol in small doses are really but a manifestation of its stimulant effects."

'67. *Humbolt's results.*—Various other experiments confirm this view of the effects of Alcohol on the animal tissues; and those of Humbolt are peculiarly valuable as regards its special capability of producing a temporary excitement of nervous power. "When the crural nerve," he says, "of a full grown and lively frog was immersed in Alcohol, if the leg was already exhausted by galvanization, the Alcohol evidently increased its excitability. If the nerve was left in it for some time, its excitability was completely exhausted. Its application exhausted instantaneously the excitability of young animals, birds, worms, and insects. If the tail of an Earth worm or Leech be dipped for only *four seconds* in Alcohol, it becomes stiff and inexcitable as far as it is immersed; and although in frogs and puppies this state of rigidity could sometimes be removed, in those animals it never

could." Other and numerous authorities might be cited, and further experiments adduced, illustrative of these points, but there is no space, nor can they be necessary. To suppose that any thing can be actually gained to the healthy system by Alcoholic stimulation is the grossest delusion. So long as action and reaction are equal, and nature strives perpetually for compensation, so long will Alcoholic excitement work its own retribution—the transient heightening of vital activity affording only an extra momentum for sinking its powers to the lowest state of prostration. Alcohol can, therefore, minister to the enjoyment of the present hour only by plundering the future.

68. *Its relation to appetite for food.*—In the first glow of Alcoholic excitement and general stimulation of the functions, an individual feels an unnatural demand for food, and forthwith congratulates himself upon his improved appetite and digestion. But that extra demand is fictitious—a sheer fraud upon the system. It corresponds to no actual want, and is only a means of conveying into the body a larger amount of nourishment than it requires or can use. This excess of food becomes a fruitful source of disorder. Alcoholic liquors cannot carry through the work which they begin. Having inveigled into the system a larger than necessary allowance of food, they are not only powerless to relieve it of the encumbrance, but actually

obstruct those processes of assimilation and excretion which are the natural sequel of digestion. To the healthy man, these liquors are only instruments of gluttony, enabling him to gorge his system with more alimentary matter than were otherwise possible. If spirits are habitually used as an excitant of appetite, the digestive apparatus loses its natural tone, and becomes, from habitual use, unable to act without the aid of foreign stimulants.

#### VIII. RELATION OF ALCOHOL TO DISEASE.

69. *Can it protect from contagion?*—It has been also pertinaciously asserted that Alcohol has the power of arming the human system against the invasion of epidemic and contagious diseases. But this statement is at palpable variance with both reason and experience. The only resistance to the assaults of contagion, which the system is capable of making, is that which is afforded by the healthful and vigorous exercise of all its functions, which constitutes the highest condition of health. It is when its tone is depressed, the circulation sluggish, and the vital energies exhausted, that the constitution is least capable of self-defence from morbid and epidemic causes. A prolific soil is thus prepared in the system, and the seeds of disease find a ready lodgment there. Any cause, therefore, which

tends to disorder the equable and harmonious action of the living mechanism, which breaks the full and equal current of vital activity into an alternate succession of excitements and prostrations, now arousing it to inordinate effort, and then sinking it in languor and debility, is an efficient preparative for contagion. Such is pre-eminently the action of Alcohol, so that if we were to ransack the storehouses of both nature and art, we could probably find no substance more malignly adapted than this to level the safe-guards of health, and expose the defenceless constitution to the deadliest arrows of pestilence.

70. *Testimony upon the point.*—In fatal accordance with these inductions of reason, is the testimony of universal experience. There is but one appalling conclusion to be deduced from hospital records, medical statistics, and the vast array of facts which bear upon the question; it is that among no class of society are the ravages of contagion so wide-spread and deadly, as those who are addicted to the use of Alcoholic beverages. They place beyond all possible contest the facts that epidemic malaria, and all forms of death-inducing miasms, and pestilential poisons, take effect with the utmost promptitude and certainty, upon constitutions vitiated by Alcoholic indulgence. The evidence upon this point is endless and concurrent. Says Dr. John W. Francis, "every one at all conversant

with the history of epidemics, knows full well the greater ravages which pestilence makes upon those individuals who indulge largely in spirituous potations; witness the accounts of the several visitations of yellow fever in different Ports and Towns of the U. S., and the records of the malignant cholera in New York, and elsewhere, in numerous sections of the union, in 1832 and 1834. It is forcibly imprinted on the memory of every medical man who studied the characteristics of this peculiar disorder, at our several cholera hospitals, and in private practice, that, of the whole number who sickened and died by it, a vast majority were composed of those who had been addicted to the inordinate use of Alcoholic liquors.\* Facts like the following are numerous. Says Dr. Carpenter,† “The nurses in the cholera hospital at Manchester, were at first, worked six hours, and allowed to go home the other six, and the mortality was so great among them that there were fears of the failure of the supply. It was found, however, that they were much given to Alcoholic potations (with the idea, probably of increasing their power of resisting the malady) during their leisure hours; and they were therefore confined to the hospital, and debarred from obtaining more than a small allowance of Alcoholic drink; after which not a single fresh case occurred among them.”

\* Bacchus, p. 465.

† Use and Abuse of Alcoholic Liquors, p. 70.

71. *Alcohol an efficient cause of disease.*—Whatever may be the popular infatuation, it is evident from what has been previously stated, that, so far from being the conservator of health, Alcohol is an active and powerful cause of disease. There is no one point upon which all candid and intelligent physicians are more entirely agreed than this. { Passing as it does into every part of the organism, interfering with all the normal changes of the body, respiration, circulation, nutrition, how is any other result possible? Not only do Alcoholic liquors, by their potent physiological perversions, in numerous cases, predispose the system to disorder, arouse its latent tendencies to disease, and aggravate existing maladies, but they are the distinct cause, in unnumbered instances, of positive and fatal maladies. I have not space, nor does it belong to my purpose, to enter into details upon this point; nor, indeed, would it yet be appropriate in a work designed for popular reading. Until Physiological information becomes more widely diffused, questions of this sort will continue to belong to the Doctors. I may, however, make an extract or two in passing the subject.

72. *Diseases of the Stomach.*—Says Dr. J. W. Francis, in the admirable paper above quoted: "Every body knows that the stomach, although armed with vast conservative powers, is compelled, at length, to

surrender to so efficient a conqueror as Alcohol. Its sufferings, though severe, are too often unheeded. Its most conspicuous changes, upon inspection, are the conditions of the mucous, or villous coat; softened, or removed by absorption, in its greater, or cardiac extremity, while nearer its smaller, or pyloric portion, this membrane, in a majority of cases, is thickened, of a slaty color, with its surface uneven, or nipped—the results of chronic irritation. In other instances, the mucous coat is seen studded with highly-colored appearances of vascular fullness; in inebriates, suddenly destroyed by drinking cold water in a state of high excitement; and, in very warm weather, I have found this vascular peculiarity more diffused and more varied, with marks of abrasion. In every immoderately warm summer, we have examples of this pathological nature. In the ardent summer of 1825, I examined about thirty cases of death by cold water, in nearly all of whom were found this morbid alteration of the stomach.”

73 *Dr. Beaumont's Observations.*—The case, so often quoted, of Alexis St. Martin, a Canadian soldier, who had a gun-shot wound in the stomach, which healed, leaving a permanent opening, is of great importance in this connexion. He was healthy and usually temperate, but occasionally indulged in the use of spirits, the results of which could be seen, by direct observa-

tion, through the opening in the walls of his stomach. Says the late Dr. Beaumont, the able physician, who made the observations and described his case, under date July 28, 1833: "Stomach not healthy, some erythema (inflammation) and aphthous (ulcerous) patches on the mucous surface. St. Martin has been drinking ardent spirits pretty freely, for eight or ten days past; complains of no pain, nor shows symptoms of general indisposition; says he feels well and has a good appetite. August 1st.—Inner membrane of the stomach unusually morbid; the erythematous appearance more extensive, and spots more livid than usual, from the surface of which exuded small drops of grumous (thick, clotted) blood; the aphthous patches larger and more numerous; the mucous covering thicker than common, and the secretions much more vitiated. The gastric fluids extracted this morning were mixed with a large proportion of thick, ropy mucous, and considerable muco-purulent (diseased) matter, slightly tinged with blood, resembling the discharge from the bowels in some cases of chronic dysentery."

74. *Alcohol produces Internal Disease, when the patient is apparently well.*—Let it be noticed that all this actual and visible disease of the stomach existed without any remarkable or peculiar external symptoms; "for," continues Dr. Beaumont, "St. Martin com-



plaints of no symptoms indicating any general derangement of the system, except an uneasy sensation, and a tenderness at the pit of the stomach, and some vertigo, (swimming of the head,) with dimness and yellowness of vision on stooping down and rising again; has a thin, yellowish brown coat on his tongue, pulse uniform and regular, appetite good, rests quietly, and sleeps as usual." Dr. Beaumont further states that "disordered appearances, similar to those mentioned above, have frequently presented themselves in the course of my experiments and observations. They have, generally, but not always, succeeded to some apparent cause. Improper indulgence in eating and drinking, has been the most common precursor of these diseased conditions of the stomach. *The free use of ardent spirits, wine, beer, or any intoxicating liquor, when continued for some days, has invariably produced these morbid changes.*"

75. *How Alcohol Diseases the Liver.*—Diseased livers are among the most common and universal results of Alcoholic derangement. Much of it is probably due to the direct irritating action of Alcohol upon the delicate tissue of the organ, but more is caused by the indirect action of the stimulant. It is one of the duties of the liver to separate from the blood any excess of hydro-carbon which it may contain. Now, the effect of Alcohol is greatly to increase the propor-

tion of this kind of matter in the system. This it does, both by stimulating the appetite to take more food than the organism requires, and also by preventing, as we have seen (57), the natural oxidation of the constituents of the blood and their removal by the lungs. The removal of this excess of carbonaceous matter falls to the lot of the liver, which is thus habitually overworked, and, sooner or later, becomes the seat of chronic disease. This effect becomes much more marked in warm climates, where the respiratory function is least active. If Alcohol be taken to quicken the appetite, diseased liver is almost certain to follow.

76. *Changes wrought by Alcohol in the Liver.*—Dr. Francis again remarks: “Intemperance exercises a singularly direct and potent influence on the liver. The researches of the Pathologist have led him to describe several striking alterations in it. Of all the abdominal organs perhaps this suffers most, and hence the despondency so often consequent upon the vice of hard drinking. The liver may become, by habitual intoxication, preternaturally hard or schirrous. It may be studded with tubercles, and these may be more or less deep-seated in its texture, or superficial, or without suppuration; its whole structure may also be changed; it may be obstructed and become extraordinarily enlarged; and, it is worthy of remark, that the inordinate

plethora (fulness) of the blood-vessels which so generally accompanies excess in eating and hard drinking, here evinces its detrimental influence in the most palpable manner. I once asked old Mr. Fife, the Anatomist, at Edinburgh, who was many years dissector at the University, how great was the largest sized liver he had ever encountered in his preparations of dead bodies for collegiate purposes. He answered, 'fifty pounds,' and this occurred in the person of an inebriate, who had long lived in the East Indies. When we consider that the ordinary weight of this organ in a healthy state may vary from four to seven, or eight or nine pounds, it might have been inferred that such a formidable liver would have created bile enough for a whole army; yet this man died with a deficiency of this secretion. The livers of those who abuse their constitutions by Alcohol, are, however, generally preternaturally diminished, of a pale straw color, with few traces of blood-vessels, and in a hardened or indurated state; this contracted state doubtless follows the enlarged condition, usually the result of long continued disease in this organ."

77. These passages exemplify the ravages of Alcohol among some of the most important organs of the human structure. The insidious agent borne by the circulating current to every part, sets up with more or less violence its disorganizing action in each locality,

which, according to circumstances of time or temperament, breaks out as malignant disease, either of the stomach, or lungs, the liver, heart, kidneys, skin, or brain. A volume, nay, a library, might be filled with similar details of the morbid changes and pathology consequent upon inebriety, and the records of observed cases. Medical works are full of them, and there the inquiry may be best pursued.

#### IX. ALCOHOL A POISON.

78. *Definition of a Poison.*—There is but one word in our language which describes the relation of Alcohol to the healthy human system, and that word is *poison*. “A poison,” says Webster, “is any agent capable of producing a morbid, noxious, or dangerous effect upon any thing endowed with life.” We, therefore, characterize that assemblage of “morbid,” “noxious,” and “dangerous effects” which we have shown to be produced by Alcohol, as products of poisoning.

79. *Etymology and Import of the word “Intoxicate.”*—The familiar terms of universal speech bear a witness upon this point. When persons have taken sufficient Alcohol to affect them, they are said to be intoxicated, the literal meaning of which is *poisoned*. The word is derived from *Toxicum*, the Latin for *poison*; from this we have the word *toxicology*, which signifies the

science which treats of poisoning and poisons. We have also *toxic*, agents which mean poisons, and *intoxication*, which signifies the state or condition of being poisoned. This state is, however, limited, by general acceptance, to those "morbid," "noxious," and "dangerous effects" produced upon the nervous system, which are accompanied by mental disturbance, delirium, or frenzy. Furthermore, it may be observed that Alcohol is universally ranked among poisons by Physiologists, Chemists, Physicians, Toxicologists, and all who have experimented, studied, and written upon the subject, and who, therefore, best understand it.

80. *Modes of action of Poisons.*—According to Toxicologists there are two different modes of action by which poisons destroy life. Some poisons when taken into the stomach produce a sudden and stunning effect upon the nerves, which reacts upon the heart, through the sympathetic system, suspending its action, and causing death in the same manner as would a succession of severe blows upon the pit of the stomach. This is the promptest mode by which poisons produce death. Others, when swallowed, are more or less rapidly absorbed into the blood, and, being distributed throughout the system, produce their morbid and fatal effects upon its various parts and organs (103). Now, Alcohol may act to destroy life in both these ways. In some experiments on Alcoholic poisoning made by

Dr. Christison and others, the total loss of sensibility and voluntary power so *instantaneously* followed the introduction of the poison into the stomach, especially when it was introduced in a concentrated form, as not to admit the idea that absorption could have taken place to any considerable extent. This can only occur where Alcohol is taken in large quantities, and in a highly concentrated state. In its more diluted shape, as commonly used, it is always absorbed, and produces in the system the various disorganizing and poisonous effects which have been described in the previous pages. The way in which death is brought about by Alcohol diluted and absorbed, will be noticed in a future paragraph (112.)

§1. *Poisons in small quantities.*—Let it not be objected to Alcohol as a poison, that, in small or “moderate” quantities, it does not kill. It is not necessary to the action of poisons, that they be always swallowed in fatal doses. Besides, this objection, if admissible, would annihilate all poisons, for there are none that may not be, and few that are not administered in minute doses, without fatal effects. Physicians habitually prescribe the most active poisons as remedies, to combat disease. Corrosive Sublimate, for example, is used in rheumatism, diseases of the bones, scrofulous affections, nervous disorders, and in dropsy. Arsenic is given in intermittent fevers, periodical headaches, chronic affections of the skin, neuralgia, apoplexy,

and locked-jaw. Sulphuric Acid (Oil of Vitriol) is administered as a refrigerant in fevers, to diminish unnatural heat and thirst; also, to check profuse sweating in consumption, and internal hemorrhage of the stomach; it is also given in some forms of skin diseases and dyspepsia. Nitric Acid (Aqua Fortis) is employed in heart-burn, to dissolve calcareous and phosphatic deposits, and also, in various other diseases. These were, indeed, given as medicines, but they have also been administered in equal, and even larger doses to the healthy human system, as pure poisons, without fatal results.

82. *Medicinal and Poisonous action.*—It thus appears that the same substance, without alteration of properties, may act both as a poison and as a medicine. But are both these actions the same? Assuredly not. The difference depends upon the state of the constitution that receives them. Upon the healthy system, no matter how much or how little may be used, their action is always, and essentially poisonous. It is upon the diseased system that their effect, in proper amount, is said to be medicinal. There is, therefore, no escape from the conclusion, that Alcohol, in whatever form or quantity, is a poison in all the common cases of its employment; and can only rank among medicines, when placed there by the cautious and candid physician, and judiciously used in cases of disease.

INFLUENCE OF ALCOHOL

UPON THE

BRAIN AND ITS OFFICES.

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X. VALUE OF THE BRAIN IN THE HUMAN  
CONSTITUTION.

88. *The organs of the body have a variable rank.*— Although no part of the system is without its use, and all its various organs and functions contribute harmoniously to the advancement of its grand purposes, yet these several parts have very unequal values in the maintenance of the general economy. A man may lose his hands or his feet, his organs of sight, or those of hearing, or various internal parts may be perverted, or paralyzed by disease; yet, if the Brain is untouched, the essential man still remains. In the minor circumstances of his being, he may have been rudely jostled, yet he still holds his high and responsible relation with the universe. But let this material organ become equally disordered, and the lights of the universe are suddenly quenched; manhood with



all its august considerations has vanished, and the wreck that remains awakens in us a profounder sadness than even the contemplation of the dead.

84. *The spiritual principle has its material organ.*—The glory of human nature consists in its intellectual and moral capabilities, in the ability to discover truth, in the capacity of discriminating, and the power of choosing between right and wrong. These faculties constitute man's spiritual nature, and they have a local seat in his bodily system. It is agreed by all Physiologists, that the Brain is the organ and instrument of the mind; it is, therefore, the noblest portion of the physical fabric—that for which all its other parts were made.

85. *Office of the double set of nerves.*—The Brain is the great centre of the nervous system. From it passes a double set of nerve lines which divide and subdivide until they pervade the whole fabric. One set goes to the surface of the body, and there collects impressions of the surrounding universe—its gradations of heat and cold, of light and colors, of sound and melody, and all its multiform contacts; these, in the shape of sensations, pour along the sensory filaments to the great nervous centre and seat of consciousness. The other set of nerve lines goes to the muscles, and it is along these that the will transmits

its orders to those instruments of motion, and thus commands the movements of the body. The Brain is thus a focus into which, for each living man, a universe is gathered and reproduced ; it is also the source and spring of every form of human power.

86. *Grandeur of the office of the brain.*—In this narrow chamber, which is so small that a man's hand may cover it, what grand events transpire ! Within its walls occur the sublimest order of phenomena. The thoughts that have revolutionized the world originated here ! Every achievement which sheds glory upon our race, projects which involve all nations in their operation, which radiate impulses to the ends of the earth, and send undulations of power down the current of time for thousands of years, originate here ! Acts that bless mankind in their beneficence, as well as those which darken it in the shadow of their malignity, alike have originated here ! Nay, did not all inventions and discoveries, all arts and literature, and civilization itself come into existence first in the human Brain ?

87. *A Universe dwells within it.*—It is customary to point to the heavens as the sublimest object that can engage human attention ; and certainly, the contemplation of its magnificent scenery must ever awaken the profoundest wonder. Those ponderous revolvent

orbs, sweeping through the shoreless amplitudes, as if hurrying downward to the vortex of chaos, and yet returning through their grand celestial circuits, with the punctuality of the All-Controlling; those gorgeous galaxies of stars thick strewn through the skies, and sunk so deep in the abysses of space as to be brought down to our gaze only through telescopic enchantment—what are they all but symbols of the infinite, fit and awful emblems of Eternity? And yet these heavens are duplicated in the Brain of the Astronomer. The eye of Arrago may have been darkened in blindness, yet in his Brain the planets still careered in their majestic paths. Even the last splendid extension of our planetary system, was it not purely a triumph of thought? Within the Brain of Leverrier, those planets rolled and circled through their magnificent orbits, but with motions so irregular and perturbed, that the young Astronomer feels the incompleteness of the system. In the solitude of his study, he grapples with the mighty problem, and discovers a new planet *in the recesses of his own Brain*. The Telescopicist fulfils the immortal prophecy, and the heavens acknowledge their vindicated harmonies.

88. *Sacredness of the soul's material temple.*—So, too, the whole panorama of life and being, as it unrolls in our experience, leaves its mystic impression upon this exquisite organ. Crowds of the living inhabit its

windings, and the dead also rest in its silent sepulchres. How fearfully mysterious are its offices! It is the sacrest material thing that God has made! It is, indeed, a "Laboratory of Wonders, the very masterpiece of the Almighty."

#### XI. EXERCISE OF THE BRAIN CONTROLLED BY MATERIAL CONDITIONS.

89. Now the Brain is a part of the bodily constitution, and is hence subject to its laws; it therefore cannot exercise these high functions of thought, reflection, and reason, except upon certain unalterable physical conditions. It now becomes our business to inquire something concerning what these conditions are.

90. *Pressure upon the Brain puts an end to thought.*— Being of a soft and delicate structure, the Brain is covered and protected by a strong bony case, which forms the skull. Sometimes parts of the skull are destroyed, or removed by accident or disease, leaving the naked Brain exposed. If, in this case, pressure be made upon it, every mental manifestation instantly ceases; with the removal of the pressure, it returns. It has been found, that by such compression upon the Brain conversation was arrested in the midst of a sentence, and when removed it was resumed at the same point. In a case related by Sir Astley Cooper, consciousness, which had been suspended for several

months, was restored by removing a portion of the skull which pressed upon the Brain. Great internal pressure, as by the blood in apoplexy, also destroys consciousness and all mental action.

91. *A large supply of blood to the Brain essential to Mental action.*—The activity of the Brain is also dependent upon a full supply of arterialized blood. This is more indispensable to the Cerebral and Nervous tissue than to any other portion of the body. The weight of the Brain is upon an average  $\frac{1}{15}$  that of the entire body, and yet it is estimated by different Physiologists to receive from  $\frac{1}{8}$  to  $\frac{1}{10}$  of all the blood which is distributed to the system. If the circulation of blood through the Brain be suspended but for an instant, the will and all voluntary power is prostrated, mentality is extinguished, total insensibility occurs, and continues until the circulation is restored. This is proved in numerous ways, but the following experiment of Sir Astley Cooper is very satisfactory. He tied the carotoid arteries in a Dog, so that no blood could enter the Brain except what passed through the vertebral trunks. He then compressed these trunks, so as to check the current, and immediately insensibility came on, the animal at the same time falling powerless. As soon as the blood was re-admitted, the animal recovered its consciousness and voluntary power, and stood upon its legs again.

92. *The intellectual Activity of the Brain requires that the blood should be very pure.*—But the due activity of the Brain is not merely dependent upon a constant and ample supply of blood; it requires that this blood should be in a state of extreme purity—should be freed from its Carbonic Acid and other products of the decomposition of the body. If this excretion of dead compounds is in any manner checked or interfered with, the mind is immediately affected. In the case of ill-ventillated apartments, Carbonic Acid Gas accumulates in the air. The effect of this accumulation is just in proportion to its extent, to impede or suppress the liberation of Carbonic Acid from the lungs by respiration. As it now gradually accumulates in the blood, and is sent through the Brain, the keen edge is removed from the mind; there come on an indisposition to mental exertion, blunted sensibility, obtuseness of the intellectual and moral faculties, and, finally, if the cause continues, a state of complete unconsciousness, nor can any energy of will avail to avert these consequences.

93. *The blood which enters the Brain must be highly charged with Oxygen.*—But the prime condition of intellectual action is, that the torrent of blood which rolls through the Brain should come fresh from the fountain of respiration, and be charged to its highest normal capacity with Oxygen gas. We have repeatedly

stated (50, 51) that this gas is the universal motive power of Animal Life. Throughout all the gradations of animated being, the intelligence and power of each Tribe is rigidly proportioned to the amount of this gas consumed. We have also seen that the nature of Oxygen is disorganizing; it is commissioned, within the body as without, only to burn and destroy. Now the Brain furnishes no exception to this mode of its action; on the contrary, disorganizing changes must go forward in this Organ at a rate which will correspond with the supply of the Destructive Agent. The functional activity of the Brain, that is, the action of the Intellectual and Moral faculties, involves, therefore, disintegration of its mass by the agency of Oxygen, and the chemical union of this gas with the constituents of its tissue.

94. *Dependence of Mental Activity upon the Phosphatic constituents of the Brain.*—An interesting illustration and confirmation of this action of Oxygen within the Brain is found in the increase of compounds of phosphorus in the liquid passed by the kidneys, when there has been any unusual demand upon the nervous power. “No others of the soft tissues (beside the Brain and nerves) contain any large amount of phosphorus; and the marked increase in these deposits which has been continually observed to accompany long continued *wear* of mind, whether by intellectual

exertion or by excitement of the feelings, and which follows any temporary strain upon its powers, can scarcely be set down to any other cause. The most satisfactory proof is to be found in cases in which there is a periodical demand upon the mental powers. In cases in which constant and severe intellectual exertion has impaired the nutrition of the Brain, and has consequently weakened the mental power, it is also found that any premature attempt to renew the activity of its exercise, causes the reappearance of the excessive Phosphatic discharge indicative of an undue waste of nervous matter." (Carpenter.)

95. *Intellectual power demands a healthful nutrition of the Brain.*---But where Disintegration is a part of the essential economy of nature, there must also be Nutrition; Reparative operations must follow Destructive ones. When the mind has been long acting through its instrument, the Brain, a sense of fatigue is experienced, and there is an irresistible tendency to sleep. This is the demand of nature for compensation. The Brain must have repose, so that the nutritive, reconstructing processes may restore the lost equilibrium. Hence, if there has been an unusual demand upon the powers of the Brain, whether by long continued and severe exercise of the intellect, by excitement of the emotions, or by the combination of both, in that state of *anxiety* which the circumstances of man's condition



very often induce, and where the natural tendency to sleep has been habitually resisted by a strong effort of the will, injurious results are sure to follow ; the bodily health breaks down, and too frequently, the mind itself is permanently enfeebled. It is obvious that the nutrition of the Cerebral system has become completely deranged, and that its tissue is no longer formed in a manner requisite for the discharge of its healthy offices.

96. *Excess of Blood in the Brain Disorders the Mind.*—Again, there is exaltation and disturbance of the functions of the Brain, when the circulation through it is increased to an unwonted degree. This is particularly noticed in those affections of the Brain which border on inflammation, to which the terms *Active Congestion*, and *Determination of Blood*, have been applied. We have, in such cases, excitement, or excessive activity of the Mental Powers.

97. *The Intellectual and Moral Powers may be Over-set by the Respiration of Gases.* But the most striking example of the despotic subjection of our Nobler Nature to the action of Physical Agents, is furnished by the influence of various vapors, or gases, taken into the system by breathing, and to which reference has already been made (49). Some kinds of air so act upon the Brain and Imaginative Faculties, as to create

around the Inhaler a world of delightful visions; others suddenly rouse the faculties to the utmost delirium of ungovernable excitement. Sometimes the Moral and Mental energies are steadily and gradually undermined; or, again, they may be instantaneously paralyzed. The reason of this is, that these various kinds of air, by entering the lungs, get prompt admission to the system. By their energetic chemical affinities, they break in upon the natural course of changes, and as the integrity and harmonious operation of the Mind depends upon these changes, its derangement is inevitable.

98. *Diseased Mind involves Diseased Brain*.—The intimate dependence of the Intellectual and Moral powers upon their material Organ, is further and very strikingly shown, by the fact now generally admitted by the most enlightened Physiologists and Physicians, that disordered or insane manifestations of mind, are the consequence of bodily, or Brain disease. Says Dr. Ray\*: “It is an undoubted truth, that the manifestations of the intellect, and those of the sentiments, propensities and passions, or generally of the intellectual and affective powers, are connected with, and dependent upon the Brain. It follows, then, that abnormal conditions of those powers are connected with abnormal conditions of the Brain; but this is not

\* *Medical Jurisprudence, of Insanity*, p. 65, 1853.

merely a matter of inference. The dissections of many eminent observers, among whom it is enough to mention the names of Greding, Calmeil, Foville, Falret, Gall, and Spurzheim, Bayle, Esquirol and Georget, have placed it beyond a doubt; and no pathological fact is better established—though its correctness was for a long while doubted—than that deviations from the healthy structure are generally presented in the Brains of insane subjects. In the few cases where such appearances have not been observed, it is justly concluded that death took place before the deviation was sufficiently great to be perceptible—a phenomenon not rare in affections of other Organs.” Again: “Before describing the phenomena of mania, it should be distinctly understood that it is, first, a disease of the Brain; and, secondly, that, in its various grades and forms, it observes the same laws as diseases of other Organs.”

99. *Authority of Drs. Beck and Esquirol.*—Says Dr. Beck:\* “The causes of insanity are usually divided into physical and moral, or bodily and mental; but a separation of this nature is not conducive to just views of the disease. Insanity is essentially a bodily disease, and the Moral causes operate in producing it as they do in producing other complaints.” Says the late celebrated Dr. Esquirol, perhaps the first authority

\* *Elements of Medical Jurisprudence*, vol. 1, p. 725, 10th ed., 1850.

of his time in all matters pertaining to alienation of mind: \* "Few bodies of Lunatics are now examined, in which there are not proved to exist, at the same time, softenings and tubercles of the Brain, injections and lesions of its meninges (convolutions), serous effusions in its cavities, &c., while, at the period when we made our earliest investigations, we only kept account of obvious and manifest alterations."

100. *Material Changes do not Constitute Mind.*—In stating these facts, let me not be misapprehended, as intimating the doctrine that intellectual operations *originate* or *consist* in material changes of the Brain. I only say, that in the action of the Mind, through its material Organ, these changes intervene. Our mental being has its separate duration and separate destiny; and yet, in this state of existence, it is involved with matter by certain inexorable conditions and laws, which it is of the highest consequence for us to know. I may here, with propriety, quote the beautiful language of Prof. Draper: † "Whilst, then, this body has ceased to be composed of the same identical parts which entered into its constitution a year ago, for those have passed away into the atmosphere, and new ones have taken their places, and processes of destruction and renovation have been accomplished, these

\* Pritchard on Insanity, p. 214.

† Lecture on Atmospheric Air.

necessary changes have left no impression on, and done no injury to the Intellectual Principle within. In an instant, and spontaneously, there come to recollection words which I have heard in early life, which have been registered on the tablets of the Brain; and in dreams at night, as well as during the business of the day, there arise before me long-forgotten forms of scenery that I once beheld, the remembrance of transactions in which I have borne a part. If, in the midst of all this mutation and change, this hourly escape of dead atoms by respiration and other processes, this constant re-introduction of new matter in the form of food, and its transient continuance, as a part of a living mechanism, there still remains behind an Intelligent Principle, with all its affections and feelings, and acquisitions and knowledge, unaltered and untouched, do not these things declare plainly that, after the act of death shall have utterly broken down, and dissolved, and dispersed the parts of this organized frame, there still shall remain that same Intellectual Principle unscathed, still bearing the impression of whatever it has seen, whatever it has done, whatever it has endured?"

101. *Importance of these views.*—The foregoing views are indispensable, in order that we may understand how it is that a material agent—a liquid taken into the human stomach—is capable of disordering the In-

tellectual and moral powers, and of working the profoundest revulsions in human conduct and character. I proceed to consider the relation of Alcohol to the Brain.

## XII. POISONS HAVE A LOCAL ACTION WITHIN THE SYSTEM.

102. *The Body has local attractions for the various atoms of food.*—Among the many extraordinary attributes with which the living system is endowed, its power of analyzing food is by no means the least surprising. By proper processes of solution and selection, our mixed aliments are first converted into a uniform liquid, the blood. The system then analyzes, or takes to pieces, this blood to build up its various structures. The different elements are withdrawn, at different points, according to the local needs of the organism. Those mineral atoms that go to form bones, teeth, or nails, are taken out just where these parts require to grow. And so the elements of all the various tissues are separated or attracted out of the circulating current by special local affinities. At one place, the materials for the growth of hair may be needed, and they are taken; the nervous tissue demands phosphorized elements, and the muscular sulphurized, and they are accordingly yielded by the blood. The marvel of these interesting phenomena is greatly heightened, when we consider that the affinities are

largely of a double nature, there being two symmetrical and corresponding sides to the body.

103. *The same great Law applies to the action of poisons.*—But this remarkable Law is not limited in its application, to nutritive substances taken into the system; it extends, as every one knows, to medicines which are administered to combat local diseases, and also to the action of poisons. Says Dr. Christison,\* perhaps the highest English Authority upon this subject—“Poisons are commonly, but I conceive erroneously, said to affect remotely the general system. A few of them do, indeed, appear to affect a great number of the Organs of the body, but much the larger proportion seem on the contrary to act on one or more Organs only, and not on the general system.”

104. *Examples of the Local Action of Poisons.*—Strychnine, for example, when introduced into the system, takes effect upon the spinal cord. Oil of tobacco paralyzes the heart. Arsenic inflames the mucus membrane of the alimentary passages. Mercury affects primarily the salivary glands and mouth; Cantharides, the renal organs; Chromate of Potash, the Conjunctiva, or lining membrane of the Eyelids. Iodine acts upon the Lymphatic glands; Manganese, upon the Liver; and Lead fastens first upon

\* Treatise on Poisons, p. 17, 3d Ed.

the muscles of the wrist, paralyzing them, and producing what is known among painters and white lead manufacturers as *wrist-drop*. The disturbance which these substances produce in the system may not be confined to a single part; still the tendency is to select some one portion of the organism which first and most directly suffers from the action of the Poisonous Agent.

105. *Is Alcohol also governed by this Law?*—The question now arises, and it is one of deep significance, what, under the operation of this important Law, is the physiological destiny of Alcoholic Liquors? What portion of the system do they seek out and fasten upon first, and by natural attraction? These questions are of the utmost import for, as we have before seen (78), there are immense differences in the value and importance of these parts and organs. This is the hinging point of the whole question. Does Alcohol direct its main attack against the subordinate portions of the human constitution? or, as if with infernal ambition, does it assault the very citadel of manhood, carrying its ravages into the sacred regions of intelligence and responsibility? Alas! the wail of humanity, echoed through long and weary ages from every clime under the sun, anticipates the response of science.



### XIII. ALCOHOL ATTRACTED TO THE CEREBRAL MATTER.—IT IS A BRAIN POISON.

106. *Alcohol a Brain Poison.*—It is to the apparatus of sense and thought, and Reason and Responsibility, the nervous system, and especially its great centre, the Brain, that Alcohol is first attracted after it has entered the circulatory system; and this mechanism, the Soul's consecrated instrument, affords the chief theatre of its ravages. Were some inferior Organ of the body, whose functions are of a purely physical or chemical nature, the prominent object of Alcoholic invasion, the attitude of our question would be greatly changed. But Alcohol is specifically, and to all intents and purposes, a Cerebral Poison. It seizes, with its disorganizing energy, upon the Brain, that mysterious part, whose steady and undisturbed action holds man in true and responsible relations with his family, with society, and with God; and it is THIS FEARFUL FACT THAT GIVES TO GOVERNMENT AND SOCIETY THEIR TREMENDOUS INTEREST IN THE QUESTION.

107. *Dr. Percy's Experiments and Conclusions.*—The proofs of this statement are very conclusive. All the observed facts of Human Physiology substantiate it; but to place the point beyond question, an extensive series of experiments were instituted concerning it

upon the inferior animals, by Dr. Percy of Edinburgh. Of the propriety of extending to man, with due precautions, the physiological inferences drawn from experiments upon the lower animals, the universal practice of the Medical Profession bears witness; for it is through this route that Physiology has made many of its most important advances, while Toxicology, the science which investigates the action of poisons, is still more largely indebted to this method of inquiry. Dr. Percy destroyed the life of the animals upon which he experimented, by introducing Alcohol into the stomach, and injecting it into various veins and arteries. After death, the Brain was extracted, sliced, placed in a glass vessel with some water, and the Alcohol separated by distillation. This process was repeated in a large number of cases. In announcing, at the close of his volume, the conclusions to which his experiments had led him, Dr. Percy observes—\* “A remark may here be appropriately introduced respecting the *situation* in which the Alcohol may exist in the Brain. That, to a certain extent, it is diffused through the *substance of the Brain*, and that it is not all contained in the Cerebral Vessels, will I think appear from the following circumstance; namely, that although I have subjected to analysis *a much greater quantity of blood than can*

\* Experimental inquiry concerning the presence of Alcohol in the ventricles of the Brain. p. 103.

possibly be present within the cranium, yet I have in general been enabled to procure a much larger proportion of Alcohol from the Brain, than from all this quantity of blood. Indeed it would seem that a kind of affinity exists between Alcohol and the cerebral matter." Direct investigations of this sort undertaken for special scientific purposes, must of course be confined to inferior animals, and yet the resources of science are thus by no means exhausted; for with strange infatuation men themselves volunteer to become the subjects of experiment. Dr. Percy's observations were not limited to the lower animals killed by poisoning with pure Alcohol. He also examined in the same manner the Brains of men who had destroyed their own lives by drinking Alcohol in its common diluted form of spirituous liquors, and obtained the same marked result; the *extraction of Alcohol in considerable quantity from the cerebral matter, and that too, several days after the victims' demise.*

108. *Observations of Drs. Lewis, Cook, and Kirk.*—The same fact is established by numerous other Medical Authorities. A case occurred in Edinburgh in 1840, described by Dr. Lewis, where Alcohol was detected in the *substance of the Brain*, while no Alcoholic odor could be detected in the fluid of the ventricles, (cavities,) nor indeed in any other part of the body.\* "Dr. Cook of London, in his work on nervous dis-

\* Medical Examiner, N. S., vol. 1., p. 239.

eases, has stated the case of a man who was brought dead into Westminster Hospital, who had just drunk a quart of gin for a wager. The evidences of death being quite conclusive, he was immediately examined, and within the lateral ventricles of the Brain was found a considerable quantity of a limpid fluid distinctly impregnated with gin, both to the sense of smell, and even to the test of inflammability. Dr. Kirk, of Scotland, has given a like fact by the dissection of the dead body of an Inebriate. The fluid of the lateral ventricles of the Brain exhaled the smell of whisky, and, when he applied a candle to it in a spoon, it burnt with a lambent blue flame?""\*

109. *Observations of Dr. J. W. Francis.*—"I have repeatedly," remarks Dr. Francis,† "had cases partaking much of the same character, falling under my own inspection. Upon removing the bony covering of the Brain, the exhalation of Ardent Spirits, on several occasions, was strongly manifested to the olfactories of the bystanders, as also the effused fluid conspicuous for its quantity and quality. On one occasion, while holding an inquest over the body of a drunkard suddenly cut off, some spectators who entered the room where the anatomical examination was made, asked what puncheon of rum we had opened." We shall soon have occasion to notice still further evidence that the mind's organ is the first and principal object of Alcoholic assault and disturbance.

\* Dr. Francis's Paper in *Bachus*, p. 468.

† *Ibid.*

## XIV. BRAIN DISEASE CAUSED BY ALCOHOL.

110. *Brain disease induced by the moderate use of Alcohol.*—Now Alcohol is too potent and fiery an Agent, and its disorganizing action is too varied and intense, to allow for a moment the supposition that it can often enter the Brain without the production of serious disorder. It is important also to notice that the attraction of Alcohol for the Cerebral Substance will cause that substance to be more affected than any other part or tissue by a *very minute proportion* of Alcohol in the blood. We should, therefore, expect that the habitual employment of spirituous beverages, even in moderate quantities, would tend powerfully to the production of Brain disease; and this is among the settled facts of Medical observation. The moderate use of Alcoholic Stimulants, lays the foundation of diseases in the Brain, by gradually modifying and altering the nutritive operations. The Physical and Chemical disorganization induced by Alcohol itself, the excess of blood urged Brainward by the stimulant, the succeeding stagnation, and the varying conditions of purity of the sanguinary current, all conspire to affect the vital properties of the Cerebral tissue, and undermine that series of nutritive and reparative changes which constitutes health. This condition of the Organ becomes a powerful predisposing cause to various maladies, such as Inflammation of the Brain

in its several forms, Congestion, Apoplexy, Epilepsy, and Paralysis, all of which complaints are so much more frequent among those addicted to the use of spirituous Liquors, than among others, as to leave no room for question as to the share which these liquors had in bringing them on. These forms of Cerebral disease will result from the use of Liquors in quantities so limited as never to produce "intoxication," in the current acceptation of the term.

111. *Condition of the Brain induced by Drunkenness.*  
 —The freer use of Alcoholic mixtures produces profounder disorder of the Cerebral Organ; its ravages are revealed by the dissector so that all may behold them! Says Dr. Ray—"This increased action that takes place in drunkenness, degenerates after frequent repetition, into a permanent state of Irritation, which at last becomes real Inflammation. The coats of the vessels are thickened and less transparent than usual, and in some places they assume a varicose (enlarged) appearance. The Cerebral texture is less delicate and elastic, becoming either immoderately hard or soft. These appearances, to a greater or less extent, are found in the Brains of nearly all confirmed drunkards." Says Dr. J. W. Francis, in the admirable paper from which I have before quoted,\*—"The Brain of the intemperate is the rallying point of much disor-

\* *Bachus*, p. 468.

ganizing action. Dissections have shown preternatural fullness of a venous character; the membranes of the Brain gorged with blood; in some instances, where the patient has perished from protracted Delirium Tremens (118), traces of the inordinate operation of the poison have been most distinctly seen at the basilar or inferior portion of the skull, and a highly vascular or surcharged state of the whole Brain. The substance of the Brain itself is generally more or less invaded by serum, (watery portion of the blood,) and hence the uncommon moisture of its cut surfaces. In the lateral ventricles, (cavities,) as well as at the base of the Brain, large quantities of serum have also been remarked. Other *post obit* (after death) examinations of a similar sort might be stated, corroborative of this sad condition of the Brain, whose manifestations of deranged sensation too clearly showed how far removed from a sound condition were the faculties. Hence, on some occasions, upon an investigation into the Morbid Anatomy of the structural part of the Brain itself, we discover a preternatural softness of its substance, a pulpy disorganization, and that its texture has lost its distinctive peculiarities, not unlike the specimens of disorganization ascertained in some fatal cases of Malignant Typhus."

112. *Uses of different parts of the Brain.*—The reader will recollect that the upper and chief portion of the

Brain is termed the Cerebrum. This constitutes the main mass of the Organ, and is generally regarded as the seat of the higher Intellectual and Moral faculties. Below this, and seated at the back of the head, is another portion of the Organ called the Cerebellum; and it is commonly understood by Physiologists to be the seat of control of the movements and actions of the body. Below the Cerebellum, and connecting the Brain with the Spinal Cord, is a third and smaller portion of the nervous mass called the *Medulla Oblongata*. Several sets of nerves originate here, and, among them, those which control the respiratory function, or the action of the lungs.

113. *Alcohol affects unequally different portions of the Brain.—How it causes Death.*—The selective power of Alcohol, remarks Dr. Carpenter, appears to lead it first to attack the cerebrum; the *Intellectual Powers being affected* before any disorder of sensation or motion manifests itself, and to this it seems to be limited in the *first stages* of intoxication. In the second stage of intoxication, there is not only a complete perversion of the intellectual powers, but the duties of the cerebellum are also interfered with, as is shown by the unsteady, tremulous, and zigzag movements and diminished control of the muscles. In the third stage of intoxication the offices of both cerebrum and cerebellum appear to be completely suspended, and now



the Medulla Oblongata is affected, as indicated by the embarrassed and difficult respiration. As already stated, (57,) the admixture of Alcohol with the blood has a tendency to give a Venous character to that of the arteries; now, when, the respiration becomes imperfect and obstructed, the blood will rapidly become more and more impure, until its influence upon the Medulla Oblongata is so directly poisonous that it can no longer perform its duties, the respiratory movements are utterly brought to a stand, and death takes place by asphyxia (suspended respiration) the same as in drowning, or strangling, or in narcotic poisoning by other substances.

#### XV. MENTAL DISORDER AND INSANITY PRODUCED BY ALCOHOL.

114. *Disorder of the Mind.*—If now, as has been abundantly shown, the sane and responsible action of the mind depends upon a sound and undisturbed condition of the brain; and if Alcohol, when taken into the system in but slight quantity, fastens upon this organ by especial attraction, and primarily, too, upon its cerebral portion, we should expect to find a disturbance of mental operations among the very first effects of the ingestion of Alcoholic Liquors. And that such is the fact, few can fail to have observed in this country,

where drinking is so common a usage. Indeed, in the Psychological phenomena which follow the introduction of the stimulant into the system, we have additional and convincing proof of the doctrine that the mind's instrument is the earliest and chief object of Alcoholic attack. It is important that we note carefully the nature of this first deviation from the due and healthful course of intellectual activity which is induced by the employment of small quantities of spirituous liquors.

115. *Unequal action of Alcohol upon the Mental Faculties.*—Says Dr. Ray :\* “The first effect of Alcoholic Liquors is to exalt the general sentiment of self-satisfaction, and diffuse an unusual serenity over the mind. The intellectual powers act with increased vigor, the individual feels an exhilaration of spirits, a sense of warmth and gayety, and his imagination is crowded with delightful images. The sight and hearing are very slightly affected, a low humming sound is heard in the pauses of conversation, and objects are enveloped in a slight mist, which prevents them from being seen distinctly. Thus far there is no appearance of drunkenness.” It will be noticed that our author in the preceding quotation, states that the Intellectual Powers act with increased vigor, yet he mentions the imagination, as if it might be the object of

\* Medical Jurisprudence of Insanity p. 435.

special and primary excitement. Accordingly we find that the Imaginative and Ideal powers—the creative and combining faculties which give rise to sallies of wit, and that mental effervescence which is so much prized in social and convivial circles—seem to be first provoked to unusual activity by the working of the stimulant in the Brain. We thus understand how it is that, in all ages, persons of brilliant imaginative gifts, Poets, Painters, Novelists, Musicians, Orators, have, as a class, been especially characterized by their devotions to Bacchus. The history of these men has been but too often a brief and mournful one. They at first used but small quantities of the stimulant; but the amount that sufficed at first to kindle the scintillations of Genius soon failed. By an inexorable Physiological Law, the amount of the stimulant necessary to produce the desired effect, must be steadily increased until at length the exhausted nervous and vital energies utterly break down, and the victims descend to a premature grave. The high Reflective and Reasoning powers, the Memory and Judgment, are not thus quickened by Alcoholic stimulation. Indeed, that spontaneous mental activity which it is the tendency of Alcohol to excite, is unfavorable to the exercise of the observing and purely reasoning faculties, or to the steady concentration of thought upon subjects of difficult or profound investigation. Hence we find that the greater part of that intellectual labor which has

most extended the domain of human knowledge, has been performed by men of remarkable sobriety of habit—many of them having been constant water-drinkers.

116. *This earliest disturbance of the Mind's action is Insanity.*—I quote at this point the significant words of Dr. Carpenter.\* “The state of Mental excitement just described, is very similar to THE INCIPIENT STAGE OF PHRENITIS, OR MANIA. It is not a *uniform exaltation* of the Mental powers, but, in some degree a *perversion* of them; for, that voluntary control over the current of thought which is the distinguishing character of the sane Mind of Man, is considerably weakened, so that the heightened Imagination and enlivened fancy have more unrestricted exercise; and, while ideas and images succeed each other in the Mind with marvelous readiness, no single train of thought can be carried out with the same continuity as in the state of perfect sobriety. THIS WEAKENING OF THE VOLUNTARY CONTROL OVER THE MENTAL OPERATIONS, MUST BE REGARDED, THEN, AS AN INCIPIENT STAGE OF INSANITY.”

117. *Effects of Alcohol upon the Mind, in intoxicating doses.*—As the Alcoholic potations are increased, and intoxication comes on, the disorder and aberation of

\* Use and abuse of Alcohol, p. 11.

Mind become palpable to all. The power of controlling the direction of the thoughts is completely lost; ideas flow with confused and incoherent rapidity; the Mind is crowded with phantoms and strange images, or possessed by delusions and hallucinations. For example, the Inebriate is apt to imagine either that he has offended some one, and shows a ludicrous anxiety to apologize; or, that he has been offended, and fixes upon some one as the object of his maledictions, perhaps, his blows. He confounds one person with another. His perceptions of form, distance, number, get utterly confused; the sensations are disturbed; there is ringing in the ears; double-vision, lights burn all colors in succession; and there is oppression, dizziness and swimming of the head. The moral faculties are equally perverted, and work out all possible discordances. Some become jubilant and boisterous, and others sad and melancholy. Some are mellowed down into the foolishness of good-nature; others it makes sour, ill-tempered, jealous, suspicious and quarrelsome. Some leak out improper truths; and others rain lies upon all around. The moral powers are marked by a *distorted*, if not indeed by an *inverted* action. In the loss of the Mind's balance, as the high controlling faculties of reason and judgment gradually break down and lose their governing energy, the lower animal propensities and all the baser passions of Human Nature, are stimulated to unwonted activity. As clear-

sighted rationality relaxes its grasp upon the helm of Human Conduct, it is seized by blind and unregulated passion. The Mental excitement here takes the form of *Delirium*.

118. *Delirium Ebriosum, or Drunken Madness*.—Considering that the state of intoxication is itself, strictly speaking, a transient paroxysm of insanity, it can excite no surprise that a confirmed state of Mental derangement should frequently result from the repetition of the cause which produces the single paroxysm. There are, in fact, some individuals in whom a fit of positive madness which persists for some little time after the immediate effects of the stimulus have subsided, is brought on by every excess in drinking. The head becomes extremely hot; the face flushed; the pulse very frequent, full and hard; the temper is excessively violent, the individual sometimes attacking every one who comes in his way, and being always prone to ferocity against any one who opposes him; and, all sense of danger being lost, he is not deterred from violence by the fear of personal injury, but rushes madly upon what may prove his destruction. This condition is obviously an exaggeration of one of the ordinary forms of excitement in common intoxication. The frequent repetition of this paroxysm—of which, as of ordinary drunkenness, the stimulating action of Alcohol on the nervous centres, must be re-

garded as the immediate cause—is almost certain, like the recurrence of regular maniacal paroxysms, to end in some settled form of Insanity. (Dr. Carpenter.)

119. *Delirium Tremens, or Delirium with Tremors.*—Those who are addicted to the habitual use of Alcoholic mixtures, are also liable to another form of nervous or Brain disease, which is commonly known, from one of its most marked symptoms—the peculiar tremor of the limbs,—as *Delirium Tremens*. This state is, in many respects, the opposite of the preceding. There is little or no heat of the head, or flushing of the face; the skin is cold and humid, and even chilly. The pulse, though frequent, is small and weak; and the temper, though very irritable, is not violent; the permanent disposition, indeed, being *anxiety* and *apprehension* of injury or danger. There is an almost entire want of sleep; and even, if repose be attained, it is very imperfect, being interrupted by frightful dreams. On the other hand, the waking state is so disturbed by illusions of a disagreeable or frightful nature, that it differs but little from that of sleep, save in the partial consciousness of external things. (Carpenter.) The victims of this terrible malady are suspicious, mistrustful, and subject to constant fears and alarms. They have disordered conceptions of intense and bewildering vividness, which, it is true, they sometimes regard as delusions, but oftener mistake

for realities, and act accordingly. Their passions, particularly those of fear, jealousy, and anger, have an uncontrollable mobility, their desires and aversions are equally morbid, and the will displays a wild and sleepless energy of action. One of the most common hallucinations, is that of seeing devils, fiends, snakes, spiders, vermin, and all manner of offensive and unclean things, peopling every nook and corner of the apartment with their loathsome presence, creeping upon the bed-clothes, or crawling over the naked flesh. Inspired by the terror of these delusions, the wretched patient often attempts self-destruction. He is frequently under the illusion of being pursued and hunted by mortal foes, and sometimes, confounding his wife or attendant with his enemies, he murders them.

120. *Cause of Delirium Tremens.*—This terrible state, too, is but the manifestation of the disordered condition to which the Brain has been brought by the habitual use of Alcohol, and plainly exhibits the complete perversion of its functional power, and of its nutritive operations. It may be the result of nervous exhaustion, such as occurs at the end of a prolonged debauch; or, it may occur from want of the stimulant, and is then no less due to the previously prostrate condition of the nervous system, which nothing but the renewal of the potent stimulus can excite to any thing like regular action. Delirium



Tremens, also, frequently comes on as a consequence of habitual tipping, many having been the subjects of its attack who never drank to intoxication. The cause, however, in these instances is quite the same, the gradual undermining and subversion of the Cerebral energies by altered and defective Brain nutrition.

121. *Dipsomania, or Oinomania.*—There is another species or form of mania, with peculiar manifestations, which has been termed Dipsomania, or Oinomania. Esquirol regards it as the consequence of pathological changes in the Brain, and does not consider its unhappy subjects as responsible beings. “The patient is incessantly under the most overwhelming desire for stimulants. He will disregard every impediment, sacrifice comfort and reputation, withstand the claims of affection, consign his family to misery and disgrace, and deny himself the common necessaries of life, to gratify his insane propensity. In the morning, morose and fretful, disgusted with himself and dissatisfied with all around him, weak and tremulous, incapable of any exertion either of mind or body, his first feeling is a desire for stimulants, with every fresh dose of which, he recovers a certain degree of vigor, both of body and mind, till he feels comparatively comfortable. A few hours pass without the craving being so strong; but it soon returns, and the patient drinks till intoxication is produced. Then succeed the restless

sleep, the suffering, the comparative tranquility, the excitement, and the state of insensibility; and, unless absolutely secluded from all means of gratifying the propensity, the patient continues the same course till he dies, or becomes imbecile. It must be remarked, that, in all these forms of the disease, the patient is perfectly incapable of self-control; that he is impelled, by an irresistible impulse, to gratify his propensity; that, while the paroxysm is on him, he is regardless of his health, his life, and all that can make life dear to him; that he is prone to dissipate his property, and easily becomes the prey of the designing; and that, in many cases, he exhibits a propensity to commit homicide or suicide. He is thus dangerous to himself and others; and, however responsible he may have been for bringing the disease on himself, his responsibility ceases as soon as he comes under the influence of the malady. Of the Chronic form, I have seen only one case completely cured, and that after a seclusion of two years' duration. In general, it is not cured; and no sooner is the patient liberated (from the asylum) than he manifests all the symptoms of the disease."\* (Dr. Hutcheson.) The same type of disorder in the nervous system, though with lower intensity, is oftentimes seen in common drunkards, where the appetite is subject to

\* Report of the Glasgow Lunatic Asylum for 1842.

periods and paroxysms, with lulls of greater or less duration, in which it slumbers.

122. *Alcohol a leading cause of insanity.*—Beside these distinctive aspects of madness, the use of Alcoholic mixtures is also a frequent cause of Insanity in its common forms; that is, of settled mental derangement. Dr. Beck, in his work upon Medical Jurisprudence, in enumerating the causes which lead to Insanity, mentions first, "repeated intoxication;" and medical men generally, regard Intemperance as among the most prominent and effective of the influences which induce permanent mental alienation. Great pains have been taken by the Superintendents of Lunatic Asylums to ascertain the relative frequency of the various causes which have operated to produce the Insanity of their inmates; and the results have been embodied in statistical forms. The proportion of the insane, whose condition is attributed to intemperance, varies greatly in different countries, localities and periods, ranging from ten to twenty-five, and even, in some cases, reaching to fifty per cent. When we refer, however, to other assigned causes of Insanity, "Vice and Sensuality," "Bodily Disorders," "Hereditary Predisposition," "Moral Causes," &c., we are justified in suspecting that Alcohol has had a far larger agency in the matter than the figures would at first seem to allow.

123. There are two kinds of causes which act to produce disease in the human body. The first are *Predisposing Causes* and "their action upon the system is that of slowly and imperceptibly modifying its *nutritive* operations so as gradually to alter the Chemical, Physical, and, thereby, the Vital properties of the fabric; and thus to prepare it for being acted on by causes which, in the healthy condition, produce no influence." The others are *Exciting causes*, which act promptly and directly upon the system in producing disease. Now, in the light of preceding facts, every one will see that the habitual use of Alcohol is a most powerful predisposing cause of Insanity. It impairs the Mind's stamina, and thus gives double effect to all the gusts and shocks of life, which tend to prostrate reason. We have hence the clear right to conclude that, in very numerous cases, where Insanity has been set down to other causes, its foundations were long before laid by intemperance. In estimating the relative proportion of intemperance to other causes, particularly in those Asylums which derive their inmates from the middle and higher classes of society, we must not forget that the delicacy of friends would incline them to conceal the nature of the patient's previous habits, and attribute his disorder entirely to causes from which it has seemed immediately to proceed. It is the result of careful calculation, and probably far within the truth, that one-fourth of all the wrecking of Mind that our

Asylums report, is due to the single cause of intemperance.

124. *Inebriates transmit Mental disorders to their offspring.*—No fact of Nature is better established in common observation than the transmission of qualities and peculiarities from Parent to offspring. Diseases are also hereditary, as we have all seen, or may see, in cases of Scrofula, Consumption, and various other maladies. Predisposition to Insanity is also, as is well known, hereditary. Conditions of nervous weakness and Brain disease, are thus transmissible; and so, too, is the peculiar condition of the Nervous and Cerebral system of the drunkard. It is a fact of terrible import, and which we cannot too thoroughly ponder, that the Inebriate transmits to his offspring that peculiar disordered state of the nervous mechanism which causes a demand and a craving for stimulants; he transmits a ready-made and constitutional appetite for Alcoholic poison. The habitual drunkard also transmits to his children strong tendencies to Insanity and Idiocy. In a report on Idiocy made by Dr. Howe to the Legislature of Massachusetts, we find the following astounding statement: "The habits of the parents of three hundred of the Idiots were learnt; and a hundred and forty-five, or nearly *one-half*, are reported as 'known to be habitual drunkards!' Such parents, it is affirmed, give a weak and lax constitution to their chil-

dren, who are, consequently, 'deficient in bodily and vital energy,' and predisposed, by their very organizations, to have cravings for Alcoholic stimulants; many of these children are feeble, and live irregularly. Having a lower vitality, they feel the want of some stimulation. If they pursue the course of their fathers, which they have more temptation to follow and less power to avoid than the children of the temperate, they add to their hereditary weakness, and increase the tendency to idiocy in their constitution; and this they leave to their children after them."\*

125. Such is a dense and too hasty record of the workings of Alcohol in the Human Brain—a demonstration of the high antagonism which it sustains to the intellectual principle in man. In all its countless forms and guises, in small quantities and in large, it is ever the inveterate adversary of Mind. And in thus disorganizing the Intellectual and Moral powers, a calamity is wrought which reaches all the relations of human nature. Conduct and Character have been completely revolutionized. The outward world is dislocated and ajar. All things have been jostled out of their true relations and positions. Nothing is seen aright. The man is unmanned. He is a changed being. What we formerly expected of him, we now no longer look for. The conduct which, in his previ-

\* American Journal of Medical Sciences, April, 1849, p. 437.

ous state, we should have characterized as extravagant, is now natural and expected. We hear that a stranger has been insulted or assaulted in the public way; or, that a stage-driver has run over a child in the street, or upset his vehicle, and mutilated the inmates; or, that an engineer has smashed up a train of passengers; or, that a husband has abused or killed his wife, and we instinctively ask, if the perpetrators of these acts were not intoxicated. Such transactions belong fitly and properly to the drunken or insane state. We pronounce such acts "monstrous," but they are only so when considered as resultants of the action of sane and responsible Minds. To him, with the distempered Brain and shattered intellect, they are not monstrous, but legitimate and natural.

## XVI. INTENSITY OF THE APPETITE FOR ALCOHOL.

126. As it is the province of Alcohol to disaffect that portion of the human constitution which is appointed to preside over all the rest, as it carries disorder upward among the primal and executive forces of life, we discover how deep-seated among the springs and impulses of action, is the mischief it works. When the nervous system has been long plied with this fiery, irritant poison, scourged through a succession of paroxysms and prostrations, until its

natural elastic, and sustaining energy is departed, how intense must be the demand for more of the potent stimulant, to bring that system up to anything like its normal condition! In consequence of the Brain having been so much accustomed to artificial stimulus, according to a well known law of the animal economy, it becomes incapable of an effort, without the aid of this stimulus, which is necessary to the performance of even its most ordinary exercise. Drinking thus becomes, we might almost say, an *indispensable* habit. The will is clogged and encumbered and broken down by an appetite for liquor, which may be the result of a morbid and diseased condition of body.

127. "Obviously," writes an able and acute physician, "as these pathological changes (of the Brain) are the effect of a long continued, voluntary habit, there is strong evidence in favor of the idea, that they, in turn, become efficient causes, and act powerfully in maintaining this habit, even in spite of the resistance of the will. So deplorably common has drunkenness become in this country, that there are few who have not seen the melancholy spectacle of the most powerful motives, the most solemn promises and resolutions, a constant sense of shame and danger, bodily pain and chastisement, the prayers and supplications of friendship, of as little avail in reforming the drunkard,



as they would be in averting an attack of fever or consumption. With a full knowledge of the dreadful consequences to fortune, character and family, he plunges on in his mad career, deploring, it may be, with unutterable agony of spirit, the resistless impulse by which he is mastered."

128. *A case in point.*—In an instance mentioned by Dr. Mc. Nish, the Inebriate replied to the remonstrances of his friends, who painted the distress of his family, the loss of his business and character, and the ruin of his health: "My good friends, your remarks are just; they are, indeed, too true, but I can no longer resist the temptation. If a bottle of brandy stood at one hand, and the pit of Hell yawned at the other, and I were convinced that I should be pushed in as soon as I took one glass, *I could not refrain!* You are very kind. I ought to be grateful for so many kind good friends; but you may spare yourselves the trouble of trying to reform me; the thing is out of the question." And the thing probably was out of the question. The habit had so vitiated the organs of mind, and the depraved organs had so reacted on the habit, that each had become bound to the other by bonds that death alone could sunder.

129: We are told that thousands have been reclaimed from this vice by influences applied to the mind and conscience; but what large numbers have also

been swept backward by morbid impulses which they could not resist! How many, too, who have shattered their nervous organization by the use of Alcohol, upon a change of habit, fly to opium, and the immoderate use of every stimulating principle of diet! And of those who, through strength and fidelity of purpose, have abandoned intoxicating courses, how few dare we proclaim safe, or could trust in the crisis of temptation! Experience is continually teaching the mournful lesson that such are *never* beyond the reach of danger. These facts powerfully teach us that, in the reformatory management of Inebriate classes, various innocent stimuli should be skilfully substituted for the baser stimulation of liquor.

#### XVII. RESPONSIBILITY IN DRUNKENNESS.

130. I cannot dismiss the subject of the relations of Alcohol to the brain and its functions, without offering some suggestions concerning the responsibilities of the inebriated condition. The question of the legal liabilities of drunkenness has been very differently settled among different nations. The Grecian law awarded a double punishment for a crime committed under the influence of inebriation, not only punishing the crime, but also the drunkenness that gave rise to it. The Roman law allowed the plea of drunkenness in exculpation for acts committed under its influence, except in the case of women, and these it punished capitally. Similar

discrepancy has also been observed in the legislation of modern states upon the subject. The principle of English law which governs the question, was long ago laid down by Lord Coke. "The drunkard," says he, "is VOLUNTARIES DAEMON, and whatever ill he doth, his drunkenness shall aggravate it." The courts hold that drunkenness is in itself a crime, and he who alleges it as an excuse attempts to take advantage of his own wrong.\*

131. *Violation of a fundamental principle.*—The rule of law, as respects the responsibilities of the insane, is thus stated by an able writer in the American Jurist: †  
"No principle in criminal law is more universally admitted, than that the insane man is not responsible for his acts; that guilt does not attach to the individual who is unconscious of his deeds; that it is the criminal mind, the wicked intent, which makes him the subject of punishment." One would think this "universally admitted" principle to be a self-evident truth, with enough of power in it to command universal adoption in practice; but it is daily violated in our courts by the maxim of law mentioned in the preceding paragraph; the insanity of drunkenness does not absolve from criminal responsibility. The reason offered is, that this insanity is voluntarily brought on, which is in itself a high crime.

\* American Jurist, vol. 3., p. 16.

† American Jurist, vol. 3, p. 6.

That there is no validity in this reason is shown by the fact that, in numerous other cases, insanity has arisen from the voluntary criminal habits of the individual; and yet in these instances the rule in question is not applied. Says Judge Story:\* "Many species of insanity arise remotely from what, in a moral point of view, is a criminal neglect or fault of the party, as from religious melancholy, undue exposure, extravagant pride, and yet such insanity has always been deemed a sufficient excuse for any crime done under its influence." I shall not attempt the discussion of these points; it will be more satisfactory to quote the ablest medico-legal authorities, those who have written not in the interest of a doctrine or of a party, but for the guidance and enlightenment of Judges and Legislators.

132. Says Professor C. J. A. Mittermaier,† a distinguished German writer on Medical Jurisprudence: "The drunken man loses the consciousness of the external world; the friend whom, in his sober mind, he loves, is now regarded as an enemy, in whose every look he imagines he reads a threat. *It is no longer in his power to refer what he wills to the law*, for the voice of reason is silent for him; he no longer knows what he does, and he consequently acts without responsibility, because he acts without consciousness."

\*Mason's Reports, vol. 5, p. 28.

† Effects of drunkenness upon criminal responsibility. Am. Jurist.

133. *Says Dr. Lee*, the able Editor of Dr. Guy's Forensic Medicine: "Since delirium tremens may be the result of intoxicating liquors not taken to intoxication, and since, in the eye of the law, even drinking to excess is not *criminal*, it is difficult to see wherein acts committed during a state of mental derangement thus induced, should be punishable any more than those which are the consequence of any other habits which are under the control of the individual. Gambling, commercial speculation, hard study, and a variety of other voluntary causes, it is well known, induce insanity; and yet the insane person is never regarded as responsible for his actions. In what respect, however, does he differ from him whose reason has been dethroned by the use of intoxicating drinks?"

134. *Dr. Drake on responsibility in drunkenness.*—From a very able paper,\* by the late Dr. Drake, of Cincinnati, reviewing a trial which occurred in that city, and which has been very widely quoted, I extract the following passages: "I would ask whether the court and jury have a right to travel behind the testimony which establishes the insanity, to inquire into its causes, and estimate the culpability of the *Non Compos*, not by the degree of his alienation, but the criminality of those *Causes*? I think they have

\* See *American Jurist*, Vol. iii., p. 13.

no such right. But if it is correct for them to do it in one case, it is equally so in all others; and whenever insanity is offered in defence, its causes should be ascertained, and made to determine the guilt of the accused. This, I apprehend, would be a new principle in Jurisprudence. Let us look at the practice to which it would lead. Delirium tremens is sometimes the consequence of the use of opium, and frequently results from daily stimulation with ardent spirits, without their being ever taken to the extent of intoxication. Now, all the acts of a *Non Compos* from either of these causes, must be pardoned, because there is nothing criminal in such a use of stimulants. Moreover, drunkenness itself is not unlawful, and, therefore, cannot impart a character of criminality to the actions of him in whom it may excite insanity. There are, however, many other causes of this malady which *are* criminal; such as gambling, duelling, and prostitution, all of which should be inquired into, and when found real, must, if the principle is adhered to, be made to impart criminality to the actions of the *Non Compos*. But this, I venture to assert, was never done in any country. THE TRUTH IS, THAT THE IMMUNITY FROM PUNISHMENT RESULTS FROM THE INSANITY ITSELF, AND NOT FROM THE NATURE OF THE CAUSE WHICH PRODUCED IT."

135. *Dr. Ray on responsibility in drunkenness.*\*—Says

\* Medical Jurisprudence, of Insanity, p. 453, 1853.

Dr. Ray,—“The whole theory of the English law in regard to drunkenness, is founded on the fallacy, that because the act of drinking is voluntary, the person is responsible for whatever actions it leads him to commit. An act that unintentionally leads to the commission of crime, is thus confounded with such as are deliberately designed to have this effect, the distinction being utterly overlooked between what the law calls *culpa* (fault) and *dolus* (intentional injury or crime). It is difficult to conceive why such a confusion of moral and legal distinctions should be—not overlooked—but actually acknowledged and defended, even at the present day. An essential element of crime is the previous intention; and, unless the criminal act is accompanied by wrong intentions, the author thereof is regarded by the law of all civilized people, and even by the English law, except in a few cases, as guilty of *culpa*, not of *dolus*. We are not satisfied that there should be an exception to this principle, in the case of drunkenness. If a person, who enters a stable with a lighted candle, not properly protected, and carelessly drops it into a haymow, whereby the building is destroyed, is not deemed guilty of arson; no more should one, who in a fit of drunkenness kills a fellow-being, without any previous intention so to do, be deemed guilty of murder. True, the fault of drunkenness is far greater than that

of carelessness, and consequently, should be punished with proportionate severity; but the difference is one merely of degree. The doctrine of the common law would have a shadow of support, if drunkenness were really a crime of some magnitude; but it is not so regarded by the laws of England; and, in most parts of *this* country, it is no crime at all. The free, unembarrassed use of the reasoning powers is essential to responsibility; but while the contrary condition of these powers, in insanity, absolves its subjects from the legal consequences of crime, it is not permitted to have the same effect when produced and accompanied by drunkenness. It does not seem to be a sufficient reason for this distinction, that in the latter case, the loss of moral liberty is the voluntary act of the party, while, in the former, it is the effect of disease. In the first place, the only object which the drunkard has in view is animal enjoyment; for the loss of his reason, though a certain result, is not the motive for his indulgence; and, secondly, the very insanity which is admitted in excuse for crime, may be, as in a very large proportion of cases it really is, the result of habits of drunkenness, in which the party has voluntarily persisted. Where the moral guilt is very nearly, if not precisely equal, it seems unjust that the legal consequences should differ so widely as they do, in regard to criminal acts, according as they are committed un-



der the influence of drunkenness, or of that insanity which may be one of its direct results."

136. *How the present policy works.*—In the light of these principles, it will be seen that our present legal treatment of the insane from inebriety, is marked by the bloodiest injustice; and so long as society continues to look upon it with satisfaction, will one of the most powerful reasons remain unrecognized, for sweeping the entire system of law upon this subject swiftly from our midst. What is it that we are daily doing? A man, in a paroxysm of drunken madness, when his mind is smitten with delusion, and surging with insane excitement, destroys a fellow-creature's life; and, although the act is acknowledged to be destitute of the supreme essential of criminality, the *malice prepense*, the *deliberate malign intent*, yet judicial enginery is put in motion, the wretch is projected upward to the scaffold, and his life is there strangled out of him with a cord, at mid-day, before man and God. There has been a human sacrifice—life taken without the guilt of crime.

137. *A case in illustration.*—"Nay," says the lawyer, "but there *was* crime. Drunkenness *is* crime, and that, too, of sufficient blackness to stamp with capital guilt the acts of a maniac." If I demand the universal and acknowledged legal test of criminality, the

wicked design, the settled obliquity of purpose, shall I find it so salient and pervading an element of drunkenness as to warrant the lawyer's assumption? But look at the pretext in another light. The man whom Government has just executed for the "crime of drunkenness," inherited from a drunken father a diseased nervous system, with a morbid craving for stimulants. He found the material to gratify this diseased appetite every-where. His friends early seconded the tendencies of his unhealthy constitution, and pressed him to get drunk. He had seen the Squire and the Colonel, and the Deacon and the Parson, and the Doctor, all drunk. He had seen members of the State Legislature, Governors, Members of Congress and Judges, drunk. He knew that Alcohol ran like mountain torrents among politicians; that it is their motive power at election. He knew that the nation's Birth-day is little else than a grand carnival of public drunkenness. He has himself been drunk a hundred and a hundred times without molestation; and it is only when surrounded by the death machinery, that he is first made to understand that drunkenness is a crime of so profound a dye, that even its borrowed blackness may stain an otherwise innocent action to so sombre a shade, that its author is no longer worthy of life. I have not been able to learn that the present usage is attempted to be defended on any naked principle of justice. The able writer before referred to in

the American Jurist, in advocating the existing practice, speaks of the "considerations of *expediency*, on which the drunkard is made responsible." He probably found it impossible to place the question on any higher ground.

138. *Alcohol must be a subject of Law.*—It is established by science, that Alcohol in its relations to the Human Constitution, is a substance of most marked individuality, peculiar in its properties, unlike any other compound in nature or art, and therefore, to be dealt with alone upon the basis of its own distinctive and essential character. And in this thing science only re-affirms, with clearness and power, the virtual decision of society in all ages. Alcohol has exerted a control over the destiny of countless millions of human beings, which has entitled it to recognition and a place upon the statute-books of all governments. It has had its own peculiar Legislation. There has always been a Jurisprudence of Alcohol; there is still; and the necessity for it will continue. But the demand of the age is for a new, and higher, and juster legislation; for more thorough and potential law, through which the most ubiquitous and omnipotent energy of Government shall be expressed for the protection of society in this thing.

139. In this country the people are the architects of Government. If the usefulness of the edifice is im-

paired, or the beauty of its proportions disfigured, by a decayed and unsightly leanto, the work of barbaric times, let the axe resolutely cleave the worm-eaten timbers, and clear the rickety structure to its base. With the largest knowledge and the widest experience, the latest science and the highest art, a fabric may then be reared, whose foundations shall repose in the permanence of justice, and whose walls go upward in the strength of right; so shall it prove a blessing to those who seek its protecting shelter, and coming generations pronounce the builders wise.





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the 1990s, the number of people with health insurance rose from 60 to 80 percent.

As a result of the 1990s reforms, the number of people with health insurance rose from 60 to 80 percent. The number of people with private health insurance rose from 10 to 20 percent. The number of people with public health insurance rose from 50 to 60 percent. The number of people with no health insurance fell from 40 to 20 percent.

The 1990s reforms were a success. They brought health insurance to a large number of people who had previously been uninsured. They also brought health insurance to a large number of people who had previously been underinsured. The reforms were a success because they brought health insurance to a large number of people who had previously been uninsured.

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