

ties to particular parts, upon which they produce their morbid, disorganizing or fatal effects. An English writer of high authority in toxicology, Dr Christison, says, "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." Thus, for example, arsenic in poisonous doses attacks and inflames the mucous membrane of the alimentary passages; strychnine takes effect upon the spinal cord, and lead fastens upon the muscles of the wrist, paralyzing them, and producing what is known among painters and white lead manufacturers as *wrist-drop*. The disturbance occasioned by the poisonous agent may not be confined to a single part; yet, under the action of this fundamental law of the constitution, "tendency of poisons is to seek out and faster upon particular portions of the organism first and most directly suffers from their action."

With this hasty analysis of the relative value of various parts of man's constitution, and of the law under which they are acted upon by foreign agents, I proceed to examine the manner in which it is affected by alcohol.

All alcoholic liquors, when drunk, pass into the stomach as a matter of necessity, this being the route of introduction for liquids and solids to the general system. But they do not long remain in this organ, for their presence there would speedily and utterly arrest the digestive process. "It is a remarkable fact," says Dr Dundas Thompson, "that alcohol, when added to the digestive fluid, produces a white precipitate, so that the fluid is no longer capable of digesting animal or vegetable matter." This precipitate is the coagulation of the pepsin, an essential element of the gastric juice. Those distinguished physiologists, Todd and Bowman, in their late work, say, "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 formed by the stomach." Alcoholic mixtures are therefore promptly absorbed; they penetrate the tissues of the stomach, and are quickly launched into the circulation.

The question now is, after alcohol has passed into the vital stream, and thus gets free course through the general system, what then becomes of it? Under the influence of the great physiological law to which I have referred, what is its destiny? To what part of the organism is it first and chiefly attracted? It is the nervous system, and especially its great controlling centre, the brain, that is singled out and becomes the chief focus of its ravages. This is a truth acknowledged and beyond dispute. For while it is a matter of notorious observation that spirituous liquors, when drunk, have a tendency to "fly to the head," as is evinced by the prompt mental disturbance which they produce, the dissector shows that the organ of mind is the rallying point of palpable disorganization and disease, and the ablest apologists for alcohol also bear explicit testimony to the fact. A late able writer in *The Westminster Review*, who has attempted a scientific defence of alcohol, recognize fully its special relationship to the nervous system, "by its great affinity and the

selective eagerness with which it acts on that tissue." In a controversy which you had some years since with Dr Hun, of Albany, upon the question of stomach diseases induced by alcohol, your adversary affirmed that "it is on the nervous system that its most terrible effects are produced." That alcohol has been extracted from the matter of the brain after death by intoxication, is a well established fact, and repeated instances are on record where it has been taken from the cavities (ventricles) of that organ, in sufficient strength to be set on fire and burn with its characteristic blue flame. Alcohol has been obtained from the brain several days after the victim's death, and it has been found in the cerebral substance, when it could not be detected either in the ventricles of the organ or in any other part of the body. But cases in which the action of alcohol upon the human brain can be directly or satisfactorily studied, are from the nature of things, rare and accidental. For the thorough and accurate exploration of the subject, therefore, resort has been had, as in the elucidation of many other important physiological problems, to experiments upon the inferior animals.

We are indebted to Dr Percy of Edinburgh for a course of experimental inquiries of this kind which completely settle the question and verify the conclusions drawn from observations upon the brain of man. He destroyed the animals by injecting strong alcohol into the system, and then subjected to analysis the brain and other parts to detect the presence and proportion of the poison. The result of his investigation was not only that alcohol was drawn to the brain by special attraction, but that it existed rather in the cerebral substance than in the vessels of the organ. He says: "Although I have subjected to analysis a much greater quantity of blood than can 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." He hence infers the existence of an "affinity between alcohol and the cerebral matter."

Now it can hardly be necessary to state that alcohol is an agent of such active and powerful qualities that it cannot be diffused through the cerebral tissue without giving rise to profound disturbance. I have stated that the brain is a laboratory of the most rapid vital changes, upon which its functional exercise depends. A substance of the energetic affinities and fiery irritant nature of alcohol cannot enter the theatre of these transformations without producing active interference. We know that the direct action of alcohol upon the tissues is that of a disorganizing poison, and, when lodged within the brain, this must be its kind of effect, whatever may be its degree. By its eager attraction for oxygen and its extreme inflammability, ranging in this respect high above all normal aliments, it produces an unnatural intensity of vital combustion, and consequently excitement, exhilaration, and increased action throughout the system. By robbing the arterial blood of its oxygen, it changes it prematurely to the venous condition, and contributes, as was long since shown by Dr Prout, to the unnatural retention of carbonic acid within the body. Thus, by the direct action of alcohol, disseminated through the substance of the brain, and by the altered condition of the blood which it induces, disease of the organ becomes inevitable. Accordingly, it is found that upon post mortem examination of the bodies of inebri-

ates, the brain exhibits conspicuous traces of the deleterious agent in the shape of enlargement of the vessels and thickening of their coats; watery and bloody effusions; engorgement of the membranes; preternatural softening and pulpy disorganization of the cerebral texture, with various other morbid appearances. In one case, where death was suddenly produced by an excessive quantity of rum, the brain presented bloody spots, and the cavities were loaded with blood, although the stomach was natural.

Physiologists are agreed that different parts of the brain are devoted to different uses. The first effect of alcohol is upon its higher and frontal portion, which is the seat of the intellectual and moral faculties. This part of the brain is excited by a small quantity of liquor, and when more is taken it becomes more deeply perverted, and the higher and lower portion of the organ, which controls the nerves of motion, is attacked, and the individual loses the faculty of perfectly governing or regulating the bodily movements. When a still greater quantity is drunk, the action of that part which is devoted to the higher sentiments seems utterly suspended, the power of voluntary motion is lost, and the poison passes downward to the extreme lower portion of the organ, which is connected with the spinal cord, and has charge of the respiratory process. The breathing is thus interfered with, and becomes heavy and labored, as we see in dead-drunkness. When death occurs in these cases, it is because this part of the brain becomes so deeply poisoned as to stop respiration. These effects show that alcohol is not diffused uniformly through the brain, but takes effect successively upon its several parts.

Now, if alcohol acts thus unequally upon the mind's organ, it must of course act in the same manner upon the mind itself. Its first effect through the brain upon the mind is to stimulate or excite it to increased action; but this effect is far from being a general and equal invigoration, or uniform strengthening of all the mental powers; it is on the contrary a partial and unequal action which is subversive of their harmony. Alcohol takes sides with one portion of the mental constitution against another. Perhaps the highest attribute of mind is the power of voluntary control which it has over itself, by which disturbing forces are held in check, and energies may be steadfastly directed to a continuous train of thought, or a difficult subject of investigation. Now, the effect of liquor is by no means to give increased strength in this direction. It neither imparts fixedness to the purposes, nor persistency to the will, nor the power of rigid subjection over the passionate nature. Its effects, on the contrary, are all in the opposite direction. The more volatile faculties, the imagination and ideal powers, are quickened under its influence to excessive exertion, and go off into spontaneous bursts of wit, humor, and fancy. There are brilliant corruscations of thought, and a blaze of imaginative pyrotechny. But this artificial tumult of the mind is not favorable to the calm and sober exercise of the graver faculties. As the spontaneous or automatic activity of the mind, occasioned by brain stimulation, is increased, there is a decrease of its self-controlling, self-regulating power. The mind cannot serve two masters; just in proportion as it is surrendered to the influence of an external force, which invades it through the brain, it ceases to be in its own keeping. With the sparkles and effervescence of alcoholic excitement, there is a weakening of the re-