

## Classics of the Alcohol Literature

### Erasmus Darwin on the Physiology of Alcohol

WHAT is remembered today about Erasmus Darwin, English physician of the second half of the eighteenth century (1731-1802), is mainly that he was the grandfather of Charles Darwin and that he was "quite a scientist" himself.

Erasmus Darwin had other merits than merely being the grandfather of a famous grandson. He was famed in his own time as both poet and scientist, although as a poet he was somewhat didactic and stilted while as a scientist he was a man of vivid imagination. Erasmus was ahead of his times but he did not have the discipline and solid background of his grandson to control his imagination and to put forward his advanced ideas convincingly. Charles Darwin wrote of his grandfather that he "anticipated the views and erroneous grounds of opinions of Lamarck."

The most famous work of Erasmus Darwin is his *Zoonomia*, published during the years 1794 to 1796. The first volume of this work contains a chapter entitled "Of Drunkenness." This brief chapter may be of interest to students of alcoholism, since it is one of the earliest systematic attempts to explain the physiologic action of alcohol. Theories on biochemical processes attendant upon the ingestion of alcohol were current in Erasmus Darwin's time but the strictly physiological processes had received less attention. The explanations offered by Erasmus Darwin are entirely speculative but they are nevertheless stimulating. The chapter "Of Drunkenness" is reprinted here from the original work.\*

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#### OF DRUNKENNESS

I. In the state of nature when the sense of hunger is appeased by the stimulus of agreeable food, the business of the day is over, and the human savage is at peace with the world, he then exerts little attention to external objects, pleasing reveries of imagination succeed, and at length sleep is the result: till the nourishment which he has procured, is carried over every part of the system to repair the injuries of action, and he awakens with fresh vigour, and feels a renewal of his sense of hunger.

\**Zoonomia*; or, The Laws of Organic Life. Vol. I, Sec. xxi. London; J. Johnson, 1794.

The juices of some bitter vegetables, as of the poppy and the lauro-cerasus, and the ardent spirit produced in the fermentation of the sugar found in vegetable juices, are so agreeable to the nerves of the stomach, that, taken in a small quantity, they instantly pacify the sense of hunger; and the inattention to external stimuli with the reveries of imagination, and sleep, succeeds, in the same manner as when the stomach is filled with other less intoxicating food.

This inattention to the irritative motions occasioned by external stimuli is a very important circumstance in the approach of sleep, and is produced in young children by rocking their cradles: during which all visible objects become indistinct to them. An uniform soft repeated sound, as the murmurs of a gentle current, or of bees, are said to produce the same effect, by presenting indistinct ideas of inconsequential sounds, and by thus stealing our attention from other objects, whilst by their continued reiterations they become familiar themselves, and we cease gradually to attend to any thing, and sleep ensues.

2. After great fatigue or inanition, when the stomach is suddenly filled with flesh and vegetable food, the inattention to external stimuli, and the reveries of imagination, become so conspicuous as to amount to a degree of intoxication. The same is at any time produced by superadding a little wine or opium to our common meals; or by taking these separately in considerable quantity; and this more efficaciously after fatigue or inanition; because a less quantity of any stimulating material will excite an organ into energetic action, after it has lately been torpid from defect of stimulus; as objects appear more luminous, after we have been in the dark; and because the suspension of volition, which is the immediate cause of sleep, is sooner induced, after a continued voluntary exertion has in part exhausted the sensorial power of volition; in the same manner as we cannot contract a single muscle long together without intervals of inaction.

3. In the beginning of intoxication we are inclined to sleep, as mentioned above, but by the excitement of external circumstances, as of noise, light, business, or by the exertion of volition, we prevent the approaches of it, and continue to take into our stomach greater quantities of the inebriating materials. By these means the irritative movements of the stomach are excited into greater action than is natural; and in consequence all the irritative tribes and trains of motion, which are catenated with them, become susceptible of stronger action from their accustomed stimuli; because these motions are excited both by their usual irritation, and by their association with the increased actions of the stomach and lacteals. Hence the skin glows, and the heat of the body is increased, by the more energetic action of the whole glandular system; and pleasure is introduced in consequence of these increased motions from internal stimulus. According to Law, 5. Sect. IV. on Animal Causation.

From this great increase of irritative motions from internal stimulus, and the increased sensation introduced into the system in consequence; and secondly, from the increased sensitive motions in consequence of this additional quantity of sensation, so much sensorial power is expended, that

the voluntary power becomes feebly exerted, and the irritation from the stimulus of external objects is less forcible; the external parts of the eye are not therefore voluntarily adapted to the distances of objects, whence the apparent motions of those objects either are seen double, or become too indistinct for the purpose of balancing the body, and vertigo is induced.

Hence we become acquainted with that very curious circumstance, why the drunken vertigo is attended with an increase of pleasure; for the irritative ideas and motions occasioned by internal stimulus, that were not attended to in our sober hours, are now just so much increased as to be succeeded by pleasureable sensation, in the same manner as the more violent motions of our organs are succeeded by painful sensation. And hence a greater quantity of pleasureable sensation is introduced into the constitution; which is attended in some people with an increase of benevolence and good humour.

If the apparent motions of objects is much increased, as when we revolve on one foot, or are swung on a rope, the ideas of these apparent motions are also attended to, and are succeeded with pleasureable sensation, till they become familiar to us by frequent use. Hence children are at first delighted with these kinds of exercise, and with riding, and sailing, and hence rocking young children inclines them to sleep. For though in the vertigo from intoxication the irritative ideas of the apparent motions of objects are indistinct from their decrease of energy: yet in the vertigo occasioned by rocking or swinging the irritative ideas of the apparent motions of objects are increased in energy, and hence they induce pleasure into the system, but are equally indistinct, and in consequence equally unfit to balance ourselves by. This addition of pleasure precludes desire or aversion, and in consequence the voluntary power is feebly exerted, and on this account rocking young children inclines them to sleep.

In what manner opium and wine act in relieving pain is another article, that well deserves our attention. There are many pains that originate from defect as well as from excess of stimulus; of these are those of the six appetites of hunger, thirst, lust, the want of heat, of distention, and of fresh air. Thus if our cutaneous capillaries cease to act from the diminished stimulus of heat, when we are exposed to cold weather, or our stomach is uneasy for want of food; these are both pains from defect of stimulus, and in consequence opium, which stimulates all the moving system into increased action, must relieve them. But this is not the case in those pains, which arise from excess of stimulus, as in violent inflammations: in these the exhibition of opium is frequently injurious by increasing the action of the system already too great, as in inflammation of the bowels mortification is often produced by the stimulus of opium. Where, however, no such bad consequences follow; the stimulus of opium, by increasing all the motions of the system, expends so much of the sensorial power, that the actions of the whole system soon become feebler, and in consequence those which produced the pain and inflammation.

4. When intoxication proceeds a little further, the quantity of pleasureable sensation is so far increased, that all desire ceases, for there is no pain

in the system to excite it. Hence the voluntary exertions are diminished; staggering and stammering succeed; and the trains of ideas become more and more inconsistent from this defect of voluntary exertion, as explained in the sections on sleep and reverie, whilst those passions which are unmixed with volition are more vividly felt, and shewn with less reserve; hence pining love, or superstitious fear, and the maudling tear dropped on the remembrance of the most trifling distress.

5. At length all these circumstances are increased; the quantity of pleasure introduced into the system by the increased irritative muscular motions of the whole sanguiferous, and glandular, and absorbent systems, becomes so great, that the organs of sense are more forcibly excited into action by this internal pleasureable sensation, than by the irritation from the stimulus of external objects. Hence the drunkard ceases to attend to external stimuli, and as volition is now also suspended, the trains of his ideas become totally inconsistent as in dreams, or delirium: and at length a stupor succeeds from the great exhaustion of sensorial power, which probably does not even admit of dreams, and in which, as in apoplexy, no motions continue but those from internal stimuli, from sensation, and from association.

6. In other people a paroxysm of drunkenness has another termination; the inebriate, as soon as he begins to be vertiginous, makes pale urine in great quantities and very frequently, and at length becomes sick, vomits repeatedly, or purges, or has profuse sweats, and a temporary fever ensues with a quick strong pulse. This in some hours is succeeded by sleep; but the unfortunate bacchanalian does not perfectly recover himself till about the same time of the succeeding day, when his course of inebriation began. As shewn in Sect. XVII. 1. 7. on Catenation. The temporary fever with strong pulse is owing to the same cause as the glow on the skin mentioned in the third paragraph of this Section: the flow of urine and sickness arises from the whole system of irritative motions being thrown into confusion by their associations with each other; as in sea-sickness, mentioned in Sect. XX. 4. on Vertigo; and which is more fully explained in Section XXIX. on Diabetes.

7. In this vertigo from internal causes we see objects double, as two candles instead of one, which is thus explained. Two lines drawn through the axes of our two eyes meet at the object we attend to: this angle of the optic axes increases or diminishes with the less or greater distances of objects. All objects before or behind the place where this angle is formed, appear double; as any one may observe by holding up a pen between his eyes and the candle; when he looks attentively at a spot on the pen, and carelessly at the candle, it will appear double; and the reverse when he looks attentively at the candle and carelessly at the pen; so that in this case the muscles of the eye, like those of the limbs, stagger and are disobedient to the expiring efforts of volition. Numerous objects are indeed sometimes seen by the inebriate, occasioned by the refractions made by the tears, which stand upon his eye-lids.

8. This vertigo also continues, when the inebriate lies in his bed, in the

dark, or with his eyes closed; and this more powerfully than when he is erect, and in the light. For the irritative ideas of the apparent motions of objects are now excited by irritation from internal stimulus, or by association with other irritative motions; and the inebriate, like one in a dream, believes the objects of these irritative motions to be present, and feels himself vertiginous. I have observed in this situation, so long as my eyes and mind were intent upon a book, the sickness and vertigo ceased, and were renewed again the moment I discontinued this attention; as was explained in the preceding account of sea-sickness. Some drunken people have been known to become sober instantly from some accident, that has strongly excited their attention, as the pain of a broken bone, or the news of their house being on fire.

9. Sometimes the vertigo from internal causes, as from intoxication, or at the beginning of some fevers, becomes so universal, that the irritative motions which belong to other organs of sense are succeeded by sensation or attention, as well as those of the eye. The vertiginous noise in the ears has been explained in Section XX. on Vertigo. The taste of the saliva, which in general is not attended to, becomes perceptible, and the patients complain of a bad taste in their mouth.

The common smells of the surrounding air sometimes excite the attention of these patients, and bad smells are complained of, which to other people are imperceptible. The irritative motions that belong to the sense of pressure, or of touch, are attended to, and the patient conceives the bed to librate, and is fearful of falling out of it. The irritative motions belonging to the senses of distention, and of heat, like those above mentioned, become attended to at this time: hence we feel the pulsation of our arteries all over us, and complain of heat, or of cold, in parts of the body where there is no accumulation or diminution of actual heat. All which are to be explained, as in the last paragraph, by the irritative ideas belonging to the various senses being now excited by internal stimuli, or by their associations with other irritative motions. And that the inebriate, like one in a dream, believes the external objects, which usually caused these irritative ideas, to be now present.

10. The diseases in consequence of frequent inebriety, or of daily taking much vinous spirit without inebriety, consist in the paralysis, which is liable to succeed violent stimulation. Organs, whose actions are associated with others, are frequently more affected than the organ, which is stimulated into too violent action. See Sect. XXIV. 2. 8. Hence in drunken people it generally happens, that the secretory vessels of the liver become first paralytic, and a torpor with consequent gallstones or schirrus of this viscus is induced with concomitant jaundice; otherwise it becomes inflamed in consequence of previous torpor, and this inflammation is frequently transferred to a more sensible part, which is associated with it, and produces the gout, or the rosy eruption of the face, or some other leprous eruption on the head, or arms, or legs. Sometimes the stomach is first affected, and paralysis of the lacteal system is induced; whence a total abhorrence from flesh-food, and general emaciation. In others the lymphatic system is affected with

of the liver produces pain without apparent schirrus, or gall-stones, or inflammation, or consequent gout, and in these epilepsy or insanity are often the consequence. All which will be more fully treated of in the course of the work.

I am well aware, that it is a common opinion, that the gout is as frequently owing to gluttony in eating, as to intemperance in drinking fermented or spirituous liquors. To this I answer, that I have seen no person afflicted with the gout, who has not drank freely of fermented liquor, as wine and water, or small beer; though as the disposition to all the diseases, which have originated from intoxication, is in some degree hereditary, a less quantity of spirituous potation will induce the gout in those, who inherit the disposition from their parents. To which I must add, that in young people the rheumatism is frequently mistaken for the gout.

Spice is seldom taken in such quantity as to do any material injury to the system, flesh-meats as well as vegetables are the natural diet of mankind; with these a glutton may be crammed up to the throat, and fed fat like a stalled ox; but he will not be diseased, unless he adds spirituous or fermented liquor to his food. This is well known in the distilleries, where the swine, which are fattened by the spirituous sediments of barrels, acquire diseased livers. But mark what happens to a man, who drinks a quart of wine or of ale, if he has not been habituated to it. He loses the use both of his limbs and of his understanding! He becomes a temporary idiot, and has a temporary stroke of the palsy! And though he slowly recovers after some hours, is it not reasonable to conclude, that a perpetual repetition of so powerful a poison must at length permanently affect him?—If a person accidentally becomes intoxicated by eating a few mushrooms of a peculiar kind, a general alarm is excited, and he is said to be poisoned, and emetics are exhibited; but so familiarized are we to the intoxication from vinous spirit, that it occasions laughter rather than alarm.

There is however considerable danger in too hastily discontinuing the use of so strong a stimulus, lest the torpor of the system, or paralysis, should sooner be induced by the omission than by the continuance of this habit, when unfortunately acquired. A golden rule for determining the quantity, which may with safety be discontinued, is delivered in Sect. XII. 7. 8.

11. Definition of drunkenness. Many of the irritative motions are much increased in energy by internal stimulation.

12. A great additional quantity of pleasureable sensation is occasioned by this increased exertion of the irritative motions. And many sensitive motions are produced in consequence of this increased sensation.

13. The associated trains and tribes of motions, catenated with the increased irritative and sensitive motions, are disturbed, and proceed in confusion.

14. The faculty of volition is gradually impaired, whence proceeds the instability of locomotion, inaccuracy of perception, and inconsistency of ideas; and is at length totally suspended, and a temporary apoplexy succeeds.