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**GENERAL VIEWS**

RELATING TO

**THE STOMACH,**

ITS

**FABRIC AND FUNCTIONS.**

BY

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## PREFACE.

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THE following slight views come rather under the head of Physiology, but are not confined to it. I merely intend them as a few *illustrations*, and they more belong to Medicine as a science than Medicine as an art. Although *immediately* they are not connected with practical or particular results, yet *mediately*, I hope they may somewhat assist our progress in Pathology. It is only from just and rational physiological inferences that the principles of our laudable practice can be legitimately founded and formed. It is only from such that we arrive at the knowledge of prevention as well as the knowledge of cure—and Medicine, as a science, must include both. Disease in the large

sense of the term, belongs rather to *function* than *fabric*, and both should be studied together. The three chief agents of communication and support in the system, viz. Nerves, Blood-Vessels, and Absorbents, relate, it may be said, to our three most important functions, and again to our three chief classes of disease (according to the common classification now in use, that of Dr. Cullen). Morbid Anatomy gives us important lights—it shews changes of structure and organization, and points out the most valuable indications. But on such changes alone, little reliance can be placed; diseased actions exist without diseased structure, and vice versa; and unless a faithful record of pre-existing symptoms is added, the information we derive must be very imperfect. Comparative Anatomy is a much more useful ally to Physiology—indeed its most important one. Haller and Hunter were well aware of this, and



drew their greatest resources from it.— They were well aware of the importance to be derived from experiments on those living animals most resembling ourselves. They knew that the analogies and illustrations furnished by such sources, were often our only lights in investigations where we can only grope our way. The most important wheels of the machine are often the minutest and most concealed; it is in the balance and adjustment of these the nicest actions go on—it is to the living system we must look for this balance, and it is from Physiology we must learn those actions. If Physics teaches us the laws of Matter, Physiology teaches us the laws of Life. In the vast Laboratory of the animal economy, where decomposition, recomposition, and various like processes are ever going on, the measure of life is only the measure of counteraction to Chymical and Mechanical

laws. Here is to be found the most perfect apparatus of Organization—its highest result—and here is to be found the greatest tendency to derangement. The term *life* has received many definitions, and this might be one amongst the rest. To learn therefore what law, or series of laws—what action, or series of actions, this principle and its Phenomena consist in, or belong to, must surely be the only correct basis on which our medical reasonings can be founded. Anatomy, or the science of fabric, may be the trunk of the tree—but Physiology, or the science of function, must be its first branch.

We need not state that in this country Physiology has been most decidedly neglected, at least as a distinct science. The scattered discoveries we have made in it here and there have been too important not to make us the more regret that we

have scarcely a collective and confined system of the subject. The greater part of our Physiologists have been merely Physiologists on certain organs; each had his particular one to illustrate, and his particular discovery to offer; to this alone his attention was confined—by this, its connection with the system in general, and its other relations, became neglected—the chain was broken in its links—and thus the science as a body has been always in the back ground with us.

In France, and on the Continent, it has been long taught and studied, as its utility and importance demand. The medical schools in Paris shew this: they have not thought that it was more a collection of “matters of fancy,” than “matters of fact.” they have taken perhaps more enlarged considerations of the animal economy and of medicine; and though their practical

views of it as an art may be less accurate than ours, yet we must confess they have often given more dignity to it as a science, by the Physiology they have infused into it.

It is only by a careful study of the structure and appendages of each organ, that we are enabled to judge of its species of life and actions, and the part it performs in the operations of health and disease.—Where arrangement is the most exquisite, derangement will be most liable. If the human frame holds the top link in the chain of Organization, it no less holds the top link in the chain of Disease. In like manner each of its organs has its particular link in smaller but similar chains—each has its particular species of vitality and mode of action—and each requires particular views. After the study of individual structure, the relations of each, as well with the



surrounding parts as the whole system, naturally come to be considered—each may be viewed as part of a system, and that system as part of the whole. By this course we may be able to trace their minute dependencies and connections with each other—the causes and character of their derangements—and thus lay the foundations of a just and enlarged Pathology.

In the following pages I have (partly according to this method) attempted to throw a few lights on one of the most important, and perhaps the *most highly vital* of these organs. Much I know has been written on the subject, but much more remains to be written. I have not seen it discussed in the way to which I allude; at least the views taken of it were so mixed up and confounded with others, that they did not come before the reader in that shape which I think they ought to do.—



They have been rather the results of individual and solitary cases, brought forward to support certain opinions.

My wish is therefore to inquire in a very brief and simple form, into the general peculiarities of this organ, and its intimate relation with Life and Disease—to trace its actions from its structure, and the derangements to which they are liable—and thus to form a few indications by which its health may be preserved and supported.—I am well aware that the views taken are both loose & imperfect—that they are but feeble outlines—and that errors may be found; but even as such I hope they will receive candour and indulgence: and if their *manner* has been too much that of Theory and *first principles*, I hope their *matter* will be the best apology.

Bath, February, 1818.

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PRELIMINARY REMARKS

ON THE

*ALIMENTARY SYSTEM.*

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IN order to inquire into the nature and character of the Stomach, and its influence in the animal economy, it may be necessary to take some primary and elementary views of the Digestive Organs in general, considered as a whole and collective system. Of this system the Stomach forms, as it were, the principal division or department; to it therefore may be referred, and from it may be taken the chief characters by which the whole is distinguished.

One of the grand distinctions between Organic and Inorganic Matter seems to consist in the provision of an Alimentary System. Inorganic Matter owes its increase of bulk to *external accretion*, Organic Matter to *internal mechanism*; and this latter is properly speaking *growth*. The chief agent of this mechanism is the Alimentary Apparatus; it is the great and primary source of *internal life*,\* and may be said to preside over its functions; it is the first source of nutrition and assimilation, the chief medium by which one set of materials is re-composing whilst another set is decomposing, and thus the machine is kept balanced. It may be therefore termed the leading feature of organization and life, and the more perfect and compound we find this organization, & the higher we rise in the scale of animals, the more perfect and compound we in general shall find this system.

In the Vegetable Kingdom it is most sim-

\* I use the term "internal life" rather in conformity with Bichat's distinction.—See Bichat "Sur la Vie et la Mort."

ple, and scarcely to be found. It consists rather of an absorbing than a digesting Cavity. The sap ascends from the roots to the summits; what remains from nutrition is evaporated by the leaves, and what the plant cannot assimilate to itself, is thrown off by other processes. In the Polypus and some Zoophytes, it shews itself more distinctly; in the former it occupies a very large and important space well marked. In the Vermes Genus it is still more distinct. As we ascend from the white to the red-blooded animals we shall find it more perfect and predominant; it forms often the most extensive department in animal bodies, and perhaps may be termed the essential characteristic of animal life.\* As we ascend to Man, it rises in organization (or, in other words, the Parts or Organs of which it consists are both more numerous and more perfect); the Cavity it occupies is not so extensive, but its character is more com-

\* In the tribe of Actinia, Mr. Hunter has shewn that the Alimentary Cavity occupied the whole inside, and that the body of the animal formed only the Parietes of this Cavity.



plete. Being always in relation to the materials on which it has to act, and Man being able to select and appoint his food, so large a space was not requisite for its Digestion. Further, in the lower animals the Alimentary Appetite is the principal one of their nature, it is their first instinct at birth, governs them through life, and is generally the last at their death. Man, more called off by other appetites and pursuits, did not require so predominant an apparatus; living in constant relation with external matter, it was necessary that he should be supplied with counterbalancing Organs; and thus in him we find the Cerebral and Nervous Systems as pre-eminent as in the lower animals are the Muscular and Alimentary.

But in Man, though occupying a less space proportionally, and holding less dominion, it seems more complete and perfect. The parts constituting it seem more distinct *from*, though more subservient *to* each other. They have a more perfect character of sensibility, and shew greater



powers of selection in the materials on which they act. In him also we see it occupying a very large and important space and situation compared to the bulk and form of his body. We see it constituting as it were the principal machine in the great human laboratory: forming the chief instrument by which new Molecules are constantly adding to our bulk, whilst old ones are by various processes throwing off; working on raw materials of infinite variety, and exposed to their varieties of action, preparing them for conversion into our own substance, and finally ridding the system of them when become useless and excrementitious.

We therefore find it to constitute the most extensive and important body of Organs in our system. The appetite for food is even with us probably the first instinct of our nature, and begins in the earliest stages of the Fœtus. Hence these Organs (unlike others) are complete at all periods of life. They form as it were the most vital department. We see them also com-

municating with the most important Viscera, giving to and taking from them their various characters of disease, sympathizing in a most eminent degree with the whole system, affecting and affected by almost every change, holding connection with its most distant parts, and thus so strongly regulating its general health.

The offices of the Alimentary System may in a general sense be said to be twofold—*Transmission* and *Elaboration*, and of these the common result is *Digestion*.\* To perform these offices it has received the form of a long hollow Cavity or Canal traversing the Trunk, various in its dimensions, and open at both extremities. This Cavity is wide or narrow, winding or straight, according to the varieties of its functions. Incrementitious materials are constantly passing through, changing in their nature,

\* These offices, and the parts to which they belong, may be subdivided as follows:—*Mastication*, *Salivary Solution* and *Deglutition* in the Mouth, Pharynx, and Esophagus, *Chymification* in the Stomach, *Chylification* in the small Intestines, *Excretion* in the large—the arrangement of the Muscular Fibres in the latter particularly indicate their office.

and becoming excrementitious, pass out.— In the straight and narrow passages they are merely *transmitted*, in the wide and winding they are *elaborated*. Transmission more belongs to the extremities, Elaboration to the centre. In the former the agency seems more mechanical, in the latter more vital. The former is chiefly effected by the simple Coats or Parietes; the latter by the materials with which these Coats are furnished, and the Organs lying between and near them. We thus see the centre of the Canal, viz. the Stomach and Duodenum, the most organized, while the extremities, as the Pharynx and Rectum, are least so.

But it is to its elaborating offices our attention should be chiefly confined. The others are but subservient to these. The chief features of the whole system lie in its elaborating power, and in this the function of Digestion resides. The central part of the Canal is the seat of this; it is here that the alimentary materials undergo such changes, and are wrought into one

and the same substance. Here therefore, we find the most complex part of the apparatus; we find the Parietes different in structure, different in their modes of action, and different in their supply of Nerves and Blood-Vessels. Here we find various Organs provided for altering and assimilating the new materials. By this provision, the centre is so distinct from the other parts; by this, Digestion is effected. The differences of parietal structure, though producing certain differences of action, fall far short of producing those changes in which the different stages of Digestion consist.—These are solely the result of a specific organization confined to this centre, and of which Nerves and Blood-Vessels may be said to form the chief constituent. They abound here, and are supplied to the minutest parts, and we see them distributed in a very peculiar manner. In other parts of the Canal we find they are by no means abundant, nor is there any thing very remarkable in their course to be observed; the Rectum in health we know has very little sensibility. But together with this



provision of Nerves and Vessels, there are in this central part and its close neighbourhood, various Organs constantly furnishing various fluids and sending them by different channels into the great Canal. All this apparatus clearly points out the important and nice purposes assigned to this division of the Alimentary System. As we rise from the lower animals to Man, it seems to increase in complexity. Man is Polyphagous; his materials of food are very various; and hence the Organs of their Elaboration are various, although the space assigned for this Elaboration may be less.

The general structure of the Alimentary Canal is muscular. Anatomists, though divided as to the varieties of this in the different Coats, and also as to the number of these Coats, seem to be pretty well agreed that its chief and essential tissue is the muscular. Although a Mucous Membrane is the innermost lining, yet the disposition of this is dependant on the Muscular Membrane outside. This structure, though va-



rying much in different parts, presents a general appearance common to all, even the remotest, and thus its character as a Muscular Tube is preserved and identified. Indeed the whole Canal, from the Pharynx to the Rectum, may be called a long hollow mixed Muscle. This Muscle possesses in the highest degree the true essential properties that distinguish muscular structure, *sensibility* and *contractility*, true vital properties. By the former it may be said to be an Organ of *Elaboration*, it perceives and selects the proper materials of aliment. By the latter it is an Organ of *Transmission*, it moves & presses them on all sides, and expels them when excrementitious.—This Muscle is partly voluntary and involuntary—voluntary at the extremities and involuntary at its centre. It is only at the Pharynx and Rectum that we can will to pass or propel the materials—over the Stomach and small Intestines we have no control.

The Fibres of this Muscle consist in general of two layers—longitudinal and cir-

cular. They are disposed and act in a peculiar manner. From this peculiarity arises what the ancients termed the Peristole, and what we now term Peristaltic. — By this action (resembling the undulatory motions of a worm) together with the irritation resulting from the matter of food, the progress of the mass is effected. This is a truly vital action—sensibility and contractility are here most pre-eminent. Mechanical laws have no influence—the mass ascends and descends, and the principle of gravity does not affect it. So truly does it possess this vital character, and so tenaciously, that when other Organs have died away, it still exhibits life. This tenacity is principally observed in the large Intestines; and hence with some here is the *ultimum moriens*—contrary to Haller's opinion. Experiments on living animals, particularly domestic ones, shew us, that when life is completely extinct, and the body nearly cold, there are still peristaltic motions observable in the large Intestines.

The Peristole varies widely in different

parts. In the Stomach it is generally most marked; and in the Pharynx least so. In some parts, particularly the Ileum and Jejunum, it is often very irregular and interrupted.

The extent of the Alimentary Canal in Man varies. These varieties are chiefly referrible to two sources—the period of his life, and the nature of his food. In childhood Digestion is very active—growth is very rapid. New parts are constantly evolving and developing—and hence a great quantity of assimilating materials, and a somewhat larger space for their Elaboration become necessary. In youth its extent is somewhat less—the necessity of rapid growth is diminished—the external relations of the system increase—and thus it becomes counterbalanced by other Organs. In the adult, the Canal is generally five or six times the length of the whole body. The varieties of its length, referrible to the varieties of food, scarcely deserve notice.

In the Brute Tribes the varieties of its extent are very numerous, even in those of the same bulk of body. These varieties are referrible to the food employed. The more it resembles their own substance the less necessity for a large digestive apparatus. Graminivorus Animals require a very large Cavity. In the Cow and Sheep, &c. we see a great and complicated extent and form of Stomach, a large Abdomen, and a long tortuous Intestinal Tube. Their materials of aliment being so crude and unlike their own, require long delay in passing through. In the Tyger and Panther, on the contrary, we see a slender meagre belly, a short straight Intestinal Tube, and a very simple apparatus in general.—In Man, taking his food alike from the vegetable and animal kingdoms, we see a medium between them; less winding than the one, and less straight than the other.

The width of the Canal has also the greatest differences: indeed from its sudden inequalities, it is improper to use the term Canal. These differences of width relate



also to its offices, whether of Elaboration or Transmission—dilating where it elaborates, and contracting where it transmits. Its greatest dilatation is the Stomach, and here is its chief seat of Elaboration. It is chiefly from these varieties of its longitude and latitude, that the divisions of the Canal in general have been taken, and that its different denominations have been given.

But though distinct and different in these divisions, we find properties and structures similar to and common with every part; and hence our considerations of it should be more frequently taken as a whole and connected system. We view it as a vast and variously dimensioned Canal, traversing the Trunk; in one part fertilizing it with its streams—insinuating itself into its Molecules—and promoting their bulk, growth, and developement; in another part, wearing down and throwing off another set of Molecules become useless and unfit for the purposes of the economy: and thus we see the whole affording the chief agent by



which the increment and excrement of the body are balanced and held together.

When therefore we consider its extent, structure, and situation—its high, though unequal organization—its supply of Nerves and Blood-Vessels—its numerous connections in the system, and thus its influence in disease. When we consider it a vast depot wherein new materials, perfectly heterogeneous, are constantly passing and altering in their properties and actions—giving motion and irritation both to itself primarily, and surrounding parts secondarily. When we consider it in all or either of its offices, as a mechanical, chemical, or vital body of Organs, we learn the remarkable and peculiar necessity of attending to it in health and disease; and indeed that in this first attention the Prophylactic part of medicine may be said perhaps in a great measure to consist.

But it is the central part that chiefly claims our attention and inquiry; and of it we must now treat in particular. Here

is the chief seat of action—here is the nicest part of the apparatus—here may be said to exist a centre, around which a circle of vitality can be described.° Within this circle every Organ seems to live not only for itself, but those around it; all giving to and taking from each other the various types of health, disease, and derangement—all performing the most delicate operations, and holding the most central, though communicating with the most remote parts of the body. To this circle therefore our views should be anxiously directed—here, in the greater proportion of our acute diseases, I believe we shall find directly or indirectly, the primary seat of injury; and from this circle, as from a focus, we shall see it emanating and diffusing itself around.

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ALL the general views hitherto taken refer most essentially and particularly to the Stomach. It is the true centre of the circle and system we have been describing—the true *Alimentary Centre*. The most important functions, and those in which disease is principally met with, have as it were their respective centres or media.—To these the derangements and irregularities of each function may often be referred; the sources from which such arise, and in which they terminate, are here frequently to be met with, and to them consequently our attention should be chiefly confined.—Thus as the Nervous System has its centre in the Brain, the Circulating System in the Heart, and the Absorbent in the Thoracic Duct, so has the Alimentary its centre in

the Stomach. Here the general derangements of the whole system, though so extensive, may in a certain degree, be referred. Here is the part of it on which the health of the whole chiefly depends—here the most important stage of Digestion takes place.

Viewed as part of the Alimentary System, we see it possessed of many peculiarities and distinctions, both internally and externally—both in fabric and functions. We see it possessing less of the tubular form than the other divisions. We see its offices of Transmission very subordinate to those of its Elaboration, and that it is the true seat of Elaboration. It not only unites and mingles materials, and thus acts synthetically, as the Duodenum selects and separates analytically, but it furnishes them with a new agent of solution and conversion. This agent is procured, not from neighbouring Organs, but from the peculiar quantity and quality of its own Arteries and Nerves, and the peculiar structure of its own Coats. In the Duo-



denum the fluids poured out for Digestion result from neighbouring Organs, not from itself. In the Œsophagus and Pharynx they are merely mucous. In the large Intestines, the fluids poured out only serve the purposes of lubrication, and have no particular or decided properties. But in the Stomach the true Alimentary Solvent is secreted; and hence it is the chief (though not the final) Digestive seat.—On the matters constituting food, the actions of the Stomach are most marked and decisive; they undergo the most positive change of composition, and the greatest varieties of motion. It presents therefore a different extent of surface from any other part of the Alimentary Canal.

Viewed as a part of the general system, we must consider the Stomach as holding the most important rank, situation, and connections. Although it is a difficult matter to lay down a graduated scale of vitality among our Organs, yet there are some which we easily agree to place at or near the top; and of these the Stomach is a

most prominent one. If the Brain and Heart are amongst the first to be born, the Stomach is amongst the last to die.—It not only holds the Alimentary centre, but seems to hold the general centre of the system, and has been justly termed its *Citadel*. When other parts have died away, and the laws of Matter have commenced their preponderancy over the laws of life—when the Brain has ceased to perform its functions, and sensibility has become extinct, this still survives the surrounding wreck, and performs its offices. It seems a focus of vitality—the centre of a department in which the living principle is most abundant and exquisite. In this department the most important Viscera are found, each living and acting for itself and those around as before observed. All in a most particular manner are connected with the centre and obey its impulse. But not only does it hold such influence with its neighbouring parts immediately, but with others the most distant mediately. Pains of Head, Limbs, and the whole Trunk, we know often follow its slightest injuries.

We all know the rapid derangements produced often by foul matters of food alone. In the greater number of acute Fevers, I believe the Stomach to form the primary and chief seat of injury; and hence the importance of the earliest recourse to un-irritating Emetics. In Pulmonary Complaints, and where at first I never could have suspected the Stomach to have had the slightest influence, I have found the most signal benefit from the same class of medicines. In the almost entire class of Neuroses, I believe the first attention should be paid to the Stomach. In cases of the severest Obstruction of the Liver, and where there was an almost total deficiency of Bile in the Duodenum, I have found the greatest benefit from Tonics and Bitters, where Frictions and Calomel have failed. In short, in the greater proportion of the acute diseases of our Trunk, I believe the greater part of our uneasy sensations may be traced remotely or proximately to this Organ: and I believe that to restore its tone is amongst the most valuable indications in their treatment. We

all know the fatal consequences often resulting from its external injuries; we know that a very slight blow, or a draught of cold water, has produced almost immediate death; we know that a loathing or rejection of its contents, is among the most fatal symptoms of advanced disease.

It seems therefore the true Organ of Sensibility and Sympathy. When performing its functions it brings others into its actions and feelings, renders them more or less dependant, and often suspends them. After a meal we become heavy and drowsy—sensation becomes impaired—motion also—we feel chilled—the circulation is quickened—all seems to participate in the great work going on—Digestion—all seems directed towards the Stomach, and are more or less under its dominion.

In order, however, to enter into a fuller appretiation of it, let us more particularly look at its internal constitution. Hitherto we have rather loosely viewed its general aspect and external relations.—



We shall see that internally it has, as it were, the most exquisite structure perhaps of any Organ in our system.

The two grand classes of agents on which the support of the machine depends, are evidently Nerves and Arteries. They seem the chief materials of Organization and Life. Probably the best way to estimate the vitality and importance of a part, is to ascertain—first, the quantity it has of these agents; secondly, the quality; and thirdly, the proportion they bear to each other. With regard to quantity, we find the Stomach possessing a profusion of both; with regard to quality, we find them both most exquisite; as to proportion, we find them more exactly suited to each other, than I believe in any other Viscus. Its Nervous Matter comes most abundantly, both from Brain and Ganglions, and forms connections with almost every Nerve in the system. Indeed the great union of Cerebral and Sympathetic Nerves in the Stomach, is alone enough to constitute it one of the three great supports of

the machine. It connects parts the most distant; and thus preserves the integrancy and life of the whole: Affections of the upper and lower Limbs, Head, &c. thus associate with each other, and in traversing the system meet here as at a centre: but from its manifest influence with the Brain, its rank may even go higher: it may be said to almost form a centre of Sympathy between our Corporeal and Mental Structure. We know the influence which our Passions have on it; we recollect that by some Philosophers it was thought the seat of the soul. However, we need not go so far; but at least may allow perhaps that it not only is among the immediate supports of the *internal life*; but that in the *external life* it holds next place to the Brain.

When we consider it in relation to the Blood it receives, both as to quantity and quality, we no less shall see its importance. The largest branch of the Abdominal Aorta is almost confined to it. This branch comes off very short and strong, with a

large calibre, and pours out a profuse quantity of its contents on every part.—Many calculations have been made as to this quantity; but they do not afford satisfaction. Coming from a short distance from the Heart and Lungs, this Blood is highly Oxygenated, vivifying, and warm.

We therefore see it possessed of a choice and abundant supply of the chief materials of Organization; and if we attentively examine the manner in which they are distributed, we shall understand the extreme nicety and complexity of its structure, and its complete adaptation to the great functions it has to perform.

Let us however enter more particularly into these points—hitherto we have only taken loose and general views, and considered the Stomach rather in relation to the Alimentary and general System. We must now consider it more in itself, its fabric, functions, &c. Although these are well and fully known already, and almost

every fact relating to its Anatomy and Physiology has been discussed over and over again, yet it will be necessary to go so far as will contribute to the views we have originally suggested.

Viewed externally, and as part of the general system, we see it occupying the most central situation—we can almost touch with the tip of the finger the exact centre, when we lay it at what is called the “pit of the Stomach,” and this touch is accompanied with a peculiar sensation. This centrality has with some been enough to denote its importance, and to explain the high rank given to it by the ancients. The exact situation of it however can only be given in relation to its distension. In a medium state of fullness it occupies the upper and left part of the Abdomen, filling the left Hypochondriac, and extending to the Epigastric Regions, bounded at top by the Diaphragm and part of the Liver, and at the bottom by the Colon and Mesocolon. This situation and these boundaries have



of course many varieties—it is always moving and changing more or less, and thus differs from other Organs. These varieties principally depend on three circumstances—first, the quantity—secondly, the quality of the food—thirdly, the dilatibility of its chief Coat. In the morning, when empty and idle, it occupies a very small portion of the division of the Epigastrium and left Hypochondrium—in the evening, when full and in action, it often extends nearly as far as the Umbilicus; and cases have been seen in which it almost filled the Abdominal Cavity. Thus it adapts itself to the great varieties of the Ingesta, and their immense quantity, by the dilatibility of its Coats—and this dilatibility varies by age, habit, &c. In the Child it is not very great, in abstemious habits it appears small and contracted, and in those who make heavy meals, it is seen greatly and permanently dilated. The position of the Stomach also varies—it is generally transverse but oblique—this obliquity varies according to its fullness—when empty the left side is rather higher, and more back-

ward than the right; when full it often approaches to perpendicularity, the right side being curved, and forming an acute angle with its body. In this state it presses downwards into the Abdominal Cavity where there is the least resistance, and pushes before it the Viscera contained there. It may thus be loosely said, that when full it is perpendicular, when empty horizontal.

It is generally divided into an anterior and posterior surface—a great and little Curvature—and an upper and lower Aperture. The anterior is the most convex, and partly corresponds with the left Lobe of the Liver, and partly with the Diaphragm. The posterior is somewhat flatter; it generally lies on the upper part of the transverse Mesocolon. As distension takes place the surface extends towards the Arch of the Colon, and in all its progress and motion brings both it and the Mesocolon along with it, being connected with it by Peritoneal folds.

The great and small Curvatures form as

it were the right and left sides—the former terminates the Stomach forward and beneath—the latter backward and above.—When empty it lies on the Mésocolon—when full it extends to the Colon, and is pushed forward, the two folds of the Omentum recede from each other, and receive it between them embracing its outer part. In the former case the Peritoneum does not closely surround it, but leaves large intervening spaces, which are amply supplied with Blood-Vessels and Absorbents, &c. The small Curvature generally corresponds with the great fissure of the Liver, particularly the Lobulus Spigelii—it is also uncovered by Peritoneum, unless the Organ is distended—it extends from one Aperture to the other. The upper and lower Apertures are next to be considered, and form the chief peculiarities of the Organ—the former, or Cardia, lying on the left—the Pylorus, or lower, lying on the right. The former lies more backward than the latter—the Œsophagus passes into it perpendicularly immediately under the Foramen Sinistrum of the Diaphragm. In

front it is opposite to a part of the right Lobe of the Liver—in rear to the anterior of the Spine, and at the right to the Lobulus Spigelii. The Pylorus is generally found in the Epigastric Region; it is longer than the Cardia, but less circular: at top it is opposed to the body of the Liver—at bottom to the Pancreas, and at the right to the Gall Bladder. In the dead subject it is often found tinged with the contents of the latter.

These are the general external peculiarities of the Stomach. Let us consider the internal. A Mucous Coat lines the inner surface—it is in general reddish, rough, and villous, and thus distinguished from the inner Coat of the Œsophagus, which is white and smooth. At the Pyloric opening it presents (in conjunction with the superjacent Muscular Coat, to which it is closely attached) a contraction, or ring, which serves as a Sphincter, to keep the Organ shut when Chymification is going on, and to prevent the return of the food from the Duodenum.



We generally consider the Stomach to possess three Coats. Some Anatomists have added a fourth, and are divided as to the names of the three. The outside, or general Envelope, by some called Peritoneal, by others Omental, is not in strictness a Coat, but a covering—although it generally surrounds it, yet it only touches it here and there, leaving free interspace around, and thus full room for distension, of which in itself it is not much capable. This covering is generally white and smooth. What is called the large Omentum hangs from the great Curvature—and the small Omentum fills up the space between the small Curvature and the Liver.

The Muscular is the chief and important Coat—to this the others are subservient—it alone possesses the essential character of contractibility, and by it the motions of the Stomach are performed and regulated.—Unlike the Muscular Coat of the Pharynx and Œsophagus, it is very thin in general; its office being more for elaborating than transmitting. Its colour is whitish, unlike

that of the Pharynx and Œsophagus, which is reddish. It consists of two sets of fibres, remarkably disposed, and possessing very peculiar actions—here the Alimentary Peristole shews its true character, and here the chief digestive motion resides. The longitudinal are less uniform than the circular; they come in common with the Œsophagus, and are more marked and numerous at the Cardia, and least so in general at the Pylorus—the circular fibres are more generally seen at all parts, particularly the middle—they are least observable at the Cardia. By these fibres and their peculiar disposition, a worm-like motion is kept up from the Cardia to the Pylorus, the true Peristole of the Stomach. In violent irritation, this disposition is counteracted, and vomiting is produced. The Stomach is thus the true seat of the Anti-Peristole also. By the Peristole and Anti-Peristole of the Alimentary Canal, two most important classes of the Materia Medica are chiefly regulated in their actions, Purgatives and Emetics—the Stomach is the line of demarcation between them; the

former operate no higher, the latter no lower in the Canal. In the Anti-Peristole the contraction of the fibres is more rapid and forcible, & approaches the character of convulsion—there is a greater consumption of nervous energy, and thus greater exhaustion is produced in the system—it may arise not only from irritation in the Stomach, but in any Organ much sympathizing with it. In the Peristole the consumption of nervous energy is inconsiderable, and thus the operation of even the most drastic purgatives is soon effaced from the system.

The inner, or Mucous Coat, has before been alluded to. From its wrinkles and folds it is often called the Villous Coat—it is thicker than that of the Œsophagus.—We see on opening a living animal, during digestion, these moving folds—they depend on the contractions and motions of the superjacent Muscular Coat; this Coat has a greater extent of surface than the others, and thus the alimentary materials are exposed to a greater space for Elaboration:

the fluid poured out during Digestion on it comes from small Glandular Bodies lying between it and the Muscular Coat, and is secreted profusely.

To these Coats another has been added by some Anatomists, called the Nervous; but in general is not admitted as such. It is to the Muscular Coat our attention is chiefly due, by this the motions and actions of the Stomach are chiefly performed, and its dilatability caused—by this it adapts itself to various capacities of space required, as well by the Elaboration of the food, as the disengagement of Gases during Digestion—the direction of its dilatation is more perpendicular than lateral as before observed.

If then we merely view the Stomach in its mechanical offices—if we merely look to its bulk, its motions, and its coverings, we shall judge of its importance. We see it a vast hollow moving bag, filling up the centre of the machine, alternately shutting and opening to give ingress and egress to



the alimentary materials, exposed to their constant contact and changes of action—so often in a state of motion and action, and communicating this motion and action to surrounding parts.

But let us view its vital offices—let us consider its apparatus of organization—let us see how in itself it is so much an Organ of Elaboration, and how, in the system, it is so much one of Sympathy.

As before observed, it is largely supplied with two sets of Nerves, Cerebral and Ganglionic. These two sets seem to be in relation to these two offices—by the former it seems to be an Organ of Sympathy—by the latter, an Organ of Elaboration. Hence the former set appears more generally diffused over its extent—the latter more at particular portions, and more accompanied with Blood-Vessels: both sets of Nerves are largely and profusely distributed, and both meet here as at a common centre; and hence some Physiologists have considered it as a second Nervous Centre. It is not easy to trace

by the knife this Nervous distribution, and the points where the two classes meet.—As coming from the Brain, the Par Vagus is seen here to expand in its ramifications, and to terminate—having passed the Diaphragm with the Œsophagus, two great branches of this Nerve form about the Cardia two Plexuses—the anterior one is generally seen to expand over the anterior surface and great Curvature, and the posterior over the posterior surface. As coming from the Ganglia, we see the Cæliac Plexus (the principal division of the Solar Plexus, and of which it appears a prolongation) lying behind the Stomach. We see it envelope the Cæliac Artery, and afterwards ramify into several branches about the small Curvature, and uniting in several parts with those of the Par Vagus, always following and connected with branches of the Gastric Arteries, and gradually with those losing themselves between the coats.\*

\* Bichat has most ingeniously laid down one chief distinction between Cerebral and Ganglionic Nerves—the former seldom or ever accompanying Arteries—the latter always.—Bichat Anatom. Descript.

In the quality and distribution of these two-fold Nervous Filaments, we see the Stomach possessing great varieties; but in their abundance we always see it particularly marked. By this ample combination of them it is particularly distinguished from other Organs. The lower Intestines certainly exhibit the twofold Nerves, but in a far less ample manner—their sensibility is often very inconsiderable—it is chiefly by Ganglionic Filaments they are influenced. It is not because Diarrhœa often results from the almost immediate application of damp to the feet that we must conclude the bowels to be possessed of such compound ratio of sensibility. If they be also so much affected by passions of the mind, it is only a secondary and indirect affection, though the operation is so rapid. The quality of their sensibility is rather *latent* than *perceptible*—*Ganglionic* than *Cerebral*—they do not much select or perceive—their offices seem rather mechanical than vital—*Ganglionic* sensibility being more of the involuntary kind, they are more under the influence of

habit, and lose more of this sensibility by frequent impression: hence Purgatives must be increased in their doses. In the Stomach, on the contrary, the sensibility being as much Cerebral as Ganglionic, it is increased by habit; hence Emetics, if much used, must be diminished in their doses.

When we look to the Blood-Vessels of the Stomach, we find them similarly numerous and abundant. Proportioned to its bulk it perhaps receives the greatest number of any Organ in the body. The greater part of the Blood going from the Aorta to the Cæliac Artery is confined to it—although the Coronaria Ventriculi is the smallest of the three branches of this last, yet the two others give numerous ramifications to it. The Spleen, Liver, Pancreas, and Omentum are also supplied by the Cæliac; and thus a circle, as it were, is formed, of which the Stomach may be termed the centre—here therefore, as by some it has been termed a second Nervous Centre, may it not be called a second Circulating Centre? Indeed in this region



of the system we always find a remarkable concentration of Blood-Vessels as of Nerves.

The Cæliac (in its trunk) is the shortest of the Abdominal branches of the Aorta—it goes off at right angles—the Coronaria Ventriculi when given off from it ascends and gets to the right side of the Cardia, runs along the concave surface of the Stomach, and approaches the Pylorus, where it anastomoses with branches given off by the Hepatic Artery. This is its general course; but there are many varieties and irregularities often observed—it chiefly supplies the Cardiac Region; and in its course along the concave surface gives off numerous lateral branches, which anastomose and join with those of the lower branches. The Pyloric Region is chiefly supplied by branches of the other two divisions of the Cæliac Trunk, viz. the Hepatic and Splenic: these form a kind of Arterial Arch around the Pyloric Region, very remarkable and easily perceived. Thus the Cardiac and Pyloric vessels fully commu-

nicate by anastomosis, and thus every portion of the Stomach is supplied. This is the general Arterial distribution, but varieties very often occur—and indeed the three branches of the Cæliac are often so mixed and confounded with each other, that they cannot be distinguished: however we find every part and portion, even the minutest, abundantly supplied. Between its innumerable folds and rugæ we see Capillaries every where entwined and convoluted in a most remarkable manner.

From this unusually large distribution of blood, also its peculiar quality, we shall judge how much the Stomach is the seat of Elaboration, and of a peculiar kind.—When we observe the great disproportion between its bulk and this quantity of blood, we cannot suppose that it is for the mere purposes of its nutrition; we therefore find that the overplus forms the principal Menstruum, whereby the second and most important stage of Digestion is promoted.

This Menstruum the Gastric juice is the

result of arterial exhalation from the inner surface. We do not much know its properties from the difficulty of obtaining it pure—it is said to be neither acid or alkaline, not turning red vegetables to blue, or green—its peculiar feature is its solvent power.\* This power is inversely with the strength of the muscular fibres. When they cease to live they become softened, and according to Hunter, often destroyed.

From the character and peculiarity of this fluid, and from its being the chief agent of Digestion (as now generally admitted) we might consider the Stomach merely as a Chymical Vessel. This would be a narrow view—the more we consider it the more we find its vital agency predominating over either its chymical or mechanical agency. Dr. Haighton's remarkable experiment of tying the Par Vagum, shews how far its Elaborating Power is under Nervous influence. The simple

\* Spallanzani found the Gastric Juice to act on various vegetable and animal matters as a Chymical Solvent.—Vide Exper. sur la Digestion.

action of Narcotics shews this also; but how this Nervous influence is exhibited—whether it primarily affects the formation of the Gastric fluid, and how—or whether, secondarily, it affects the union and solution of the alimentary materials, and how—we are as yet ignorant, and perhaps will long be so. But to do justice to the character of the Stomach, we must evidently consider it an Organ of triple agency—Mechanical, Chymical, and Vital. As *Mechanical*, we see it moving and transmitting the alimentary materials—pressing on surrounding Organs with its bulk, and moving them also. As *Chymical*, we see it aggregating and uniting various molecules—dissolving them by its fluids—mixing and combining them—and thus forming a compound mass. As *Vital*, we see it possessed amply of that twofold Nervous agency by which, in the first instance, it acts for itself—and secondly, by which it acts for other Organs, and by which even the most distant are associated together.—We see therefore it connects the inner and outer life, and shares in both: we see it



possessing both latent and perceptible sensibility—giving this sensibility to, and taking it from all parts—and thus affording a principal focus in which the powers and properties of the whole life are concentrated.

We have hitherto considered the Stomach as to its fabric—let us now consider it in its functions.

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THE “modus operandi” of Digestion<sup>it</sup> is not very easy to explain—this process naturally divides itself into three stages—Deglutition (including Mastication and Salivary solution), Chymification, and Chylification. It is of Chymification we have to treat, as belonging to the Stomach, and as constituting the chief work of Digestion. Various theories have been offered for Chymification—we know little or nothing about it, and the analysis of Chyme has thrown no light on the subject. It has been wondered how matters of food so *heterogeneous*, should undergo such changes, and be transformed into a mass so *homogeneous*. These speculations have been very numerous and puzzling;

but it is not our business to discuss them here.\* In general they are referrible to two classes of powers—the chymical and mechanical; but we shall find the more we inquire into the process of Chymification, that like the apparatus in which it is performed, it partakes of Chymical, Mechanical, and Vital Agency mixed together. In vain would solution by the Gastric fluid, and trituration by the muscular fibres, attempt to bring about such changes, were it not for the Nervous influence and its peculiarity of operation; and were it not for that truly vital situation and power which (although we cannot well give a definition of vitality) we may easily assign to the Stomach. The nice balance and accordance between these three powers (often so opposite to each other) may assist us in explaining the Phenomena of Chymification—there seems a complete equipoise of them, and all seem to be equally concentrated here. The chymical

\* See the Works of Albinus, Haller, Van Helmont, Piteairn, Spallanzani, &c.

character of the Gastric fluid seems as strongly marked as the mechanical character of the muscular fibres—and the Vital character of the whole seems as strongly marked as either. When the Vital power (from various causes) begins to lose its balance, the Chymical immediately gets the rule, and the Gastric fluid dissolves all around. Lumbrici live and are lively in the Stomach; the Gastric fluid has no effect on them, because they are protected by a superior power to that of the Chymical one. When the Mechanical power shews a predominance, and the muscular fibres are stronger than usual, the solvent property of the Gastric fluid seems diminished, and vice versa. Thus the effect of increased trituration compensates for that of diminished solution, and the necessity of any irregular effort is avoided. The Vital and Chymical powers seem more opposed to each other in general, than the Vital and Mechanical—in Nervous affections of the Stomach, and when there appears an irregularity or diminution of Vital power, (as in cases of



Dyspepsia) the indication of the medicines used is to increase the tone and astringency of the fibres, not to promote an increase of the Gastric fluid. When ascendency takes place (as from the digestion of vegetable food), and is common in some Stomachs, our common language for such is that the Stomach has lost its tone.\* Indeed, although healthy Chymification may be said to consist in an exact balance of the three powers, yet the Chymical seems always the most strongly featured—hence solution in this fluid is now generally admitted to be the chief agent in this process. So decided and rapid a change we know does it make on the alimentary materials, that if rejected by the mouth but a few minutes after being swallowed, their properties are sometimes so altered that they become scarcely recognizable. This commencing stage of the process comes therefore more under the head of the Chymical power; for there has not been time

\* See Saunders on the Liver, page 202.

allowed for the operation of the others—and thus, though all three may be balanced in their energies, they are not simultaneous in their action.

It may be asked, what is meant by the term “Vital power” of the Stomach in promoting Chymification? It is not easy to answer the question; but from what has already been explained we may at least make some attempt—at least we may enter into its conception, although not into its expression. We have seen the Stomach possessing the highest and most exquisite Organization, and abundantly supplied with its chief materials, Nerves and Blood-Vessels—and we find that the disposition, quality, and arrangement of such are of a very peculiar kind. But all this is not enough to explain the term “Vital power”—we must look for something superadded—and here we get into mists and theories, which it is quite useless for us to enter into.

We may at least allow, that in the constitution of this Vital power, the principle

of Caloric forms a chief ingredient. We find that during Chymification, as there is a concentration of the other powers just named, in like manner is there a concentration of this. It seems abstracted from other parts of the system to be condensed here; and hence, after a meal, a slight shivering is reckoned among the healthy symptoms of Digestion. This heat arises from two sources—first, it is evolved, and rendered *sensible* in consequence of the new changes and combinations going on among the alimentary materials, together with the friction and trituration—and secondly, from the large supply of arterial blood poured in during the process. It is only during Chymification that this concentration of heat appears in the Stomach, and it is fully indicated by a Thermometer, on introducing its bulb into the newly laid open Stomach of a dog, after a meal. A glass of cold water taken during Chymification has a very different effect from one taken during its intervals—and the effects of poison we know very much depend on the time it is taken.—

The application therefore of this heat is gradual, and only results from progressive actions.

But the principal constituent of this Vital power, and indeed perhaps the principal and presiding agent in Digestion, is *Nervous Action*; but of this we shall speak more hereafter when on the subject of Indigestion.

Another agent in the process of Chymification, although a slight one, appears to be *Simple Moisture*—in each division of the alimentary canal we see an apparatus for secreting this; and we see all these secretions resemble in a certain degree each other—each division has its apparatus; where the business is merely for *Transmitting*, we see it very simple, and merely resulting from the exhalation of the inner coats; when the business is that of *Elaborating*, as in the Stomach and Duodenum, this seems not sufficient—the solution afforded by the Gastric fluid in the Stomach, and the Biliary in the



Duodenum, does not however come under the above head—simple moisture refers to mechanical, not to chymical solution. The Gastric fluid is merely a chymical solvent as the Biliary in the Duodenum; and perhaps the Pancreatic fluid also—of the properties of this however we are too ignorant to determine its precise use; but we find the Stomach furnished with this agent from other sources—we find its internal coat abundantly mucous, and small glands constantly pouring out their contents during the process. This fluid, like the Enteric juice of the intestines, serves also to lubricate the coat and sheath it from acrimonious matter.—

We cannot well compare it to the saliva, its properties are much less strongly marked, and it is probably much less copious in its secretion. Borden found that the vessels and nerves of the Parotid glands were particularly numerous—the former coming from the Carotid Maxillary and Lingual Arteries—the latter from the fifth and seventh pairs of nerves. Of Brunner's Glands, which furnish the mucous fluid of the Stomach, we know but little, and that

little has shewn that they are quite unlike the others.

Thus the general agents of Chymification appear to be *Solution*, both chymical and mechanical—*Trituration*—*Nervous Action*—*Heat*—and *Moisture*: to these may be also added motion (as proceeding not only from the Peristole, which is then so active, but from the motion and pressure communicated by the abdominal muscles and Diaphragm); all seem equally active and energetic; and all their actions seem connected and mixed with each other. The Gastric fluid penetrates and dissolves the new materials—the fibres press on and triturate them—the moisture softens and macerates them—and through the whole mass the newly-created nervous operation, together with the heat and motion, bring about that internal action, to which Fermentation bears perhaps the closest analogy. Indeed the theory of Fermentation is certainly among the most rational that has been proposed for Digestion; but when we consider that ferment-

ing substances require rest, and that in Chymification the materials are always moving—and when we consider some of the other characters and conditions of Fermentation, we shall find this theory inadmissible.

While these great changes are going on in the Stomach, its muscular coat gradually dilates—the great curvature is pushed forward—the two laminae of the Omentum recede from each other—the two apertures remain closed—the Peristole of the fibres becomes more active and regular, it gradually directs itself from left to right, from the Cardia to the Pylorus—the whole Stomach becomes in action and motion—the whole system seems to participate and direct its powers here—a slight chill is felt all over—the pulse becomes quicker—the skin seems cold and contracted—and a kind of paroxysm is brought on, which in delicate persons is particularly observable.—Hence the peculiar nicety of appor-tioning the diet of such in acute diseases, and the necessity of a strict regard to

its quality. The period which Chymification occupies is uncertain, and depends on many circumstances—the chief of which is perhaps the nature of the food; according to the greater or less resistance to the agents just mentioned is of course its detention. The period of Chylification is shorter, because its agency is less complex; the work is slighter; and when the alimentary particles have passed the Pylorus, they have lost much of their crudity, and are much easier elaborated into Chyle. It is said that both processes are effected in less than three or four hours on an average—a gentle heat succeeds over the body—the pulse becomes fuller—the skin loses its spasmodic constriction, and has a tendency to perspiration—the whole system returns to its rest, and gets rid of its paroxysm.

From the concentration of Vital power, which the animal economy evidently shews in the Stomach during the process of Chymification, we learn how much the operation of medicine (as well as food) depends



on the time at which it is administered.—If during this paroxysm any sudden depletion is made use of (as bleeding or purgatives) the Stomach must lose its share of this vital power, which is called off to other sources; and thus the whole system must be deranged and disturbed, because this organ is deranged and disturbed.—How widely different are the effects of a warm bath, taken four hours, instead of one hour, after a full meal?—even after a slight one the difference soon becomes sensible to the patient.

We also learn from the above the immense importance to be attached to a knowledge of the different degrees of digestibility in our food; but of this we shall speak more hereafter.

The diseases of Chymification may in a great measure be understood from what has been already laid down. In a large & general sense they may be classed perhaps under the three powers—the Chymical, Mechanical, and Vital. In a more confined

and partial sense, they may be classed under the six agents hitherto mentioned.—The greater the nicety with which these are balanced, the healthier the Chymification. The fibres may be weak—the Gastric fluid may be scanty or too abundant—the heat may not be sufficient—the Nervous action imperfect or irregular—and the motion and moisture may be inadequate—all these may occur more or less, and each of them may affect the other.

Under the head of Mechanical power, the muscular coat is chiefly to be considered.—During Chymification the Stomach is shortened, & the Cardia and Pylorus are brought nearer together. During this contraction of the fibres, these apertures remain closed, and the whole organ remains, as it were, closely sealed up, and intent on its work. Any gases that escape from the new combinations going on among the chymous materials, have therefore no outlet. When the fibres are deficient in this contractility, the closure of the apertures must be imperfect (particularly that of the Cardia)

—hence gases escape into the Œsophagus and mouth, and thus eructations are among the most obvious and direct symptoms of indigestion in general. The passage of gases by the Pylorus is more difficult, because here the fibres have a stronger power of contractility, are more circular, and operate much more like a sphincter than at the Cardia. If the fibres are wanting in contractility and strength, the Peristole also must be imperfect, together with the trituration, and thus two of the chief mechanical agents are impaired.

I believe one of the chief sources of this species of indigestion, viz. the mechanical, and indeed of indigestion in general, is imperfect Mastication. When the fibres have a greater work to perform than is suited to them, their contractility is strained; they exert new and irregular efforts, and the measure of their excitability soon becoming exhausted, they become permanently collapsed and unfit for their office—indeed the injuries resulting from imperfect comminution of food in the mouth are various. I

believe nothing can be more hurtful in this way than hurried meals, unless the food is of fluids. Nervous & absent people are particularly guilty of this error I have observed, & they soon find the effects of it—pain at the pit of the Stomach—flatulence and eructations—what is commonly called heart-burn soon comes on—a sense of weight, and slight difficulty of breathing, and increased inspirations—along with these is perceived a continuation of appetite; and although the meal be a hearty one, the patient is not satisfied. These latter symptoms particularly I have felt frequently.

Under the head of the Chymical powers of the Stomach, the causes of Indigestion relate solely to the gastric fluid. Of this species we cannot here say much satisfactory. We know but little of this fluid, and still less of the phenomena of its secretion, its quantity, or its qualities.

Under the head of the Vital powers of the Stomach, the causes of indigestion relate chiefly, it may be said, to Nervous



action, and indeed they are so numerous as to constitute an entire class. Of these much has been written, and we have here little room for them.

When we look to the vast supply of nerves to the Stomach—and when we consider their qualities and arrangement, as already noticed—we must see that Indigestion in general must belong to this class of agents more than any other. Indeed almost the whole Pathology of the Stomach may be sought for in nervous action. Its organic diseases are very few compared with those of the heart or lungs, or other viscera.—In Indigestion the nerves are evidently the presiding powers, and by their order or disorder the action of the whole is either regulated or deranged. If the fibres are weak or diseased—the mucus scanty—the gastric fluid vitiated, &c.—all these must be chiefly sought for in the nerves, and attention to these must be the first indication of cure. Under the class Dyspepsia are included the greater number of affec-

tions of this kind; and in all these tonics are our chief and only reliance. But it is not the stomachic nerves alone that are here concerned—it is the Nervous system in general. When a derangement takes place in this organ, it is communicated to distant parts—these in their turn give it back to the Stomach, which as it were perceives and feels the injury. Thus it becomes a focus of disease, in like manner as it is a focus of life. In Dyspepsia general tonics are often of more service than local tonics; and perhaps cold bathing and exercise alone have oftener cured the disease than any thing else. In Dyspepsia all the six agents hitherto mentioned may be deranged more or less; and yet I believe all may be found to originate from, at least to be connected with nervous derangement.—The appetite will be irregular, sometimes scanty, sometimes voracious—acidities will be felt—the food will be undissolved—pain and spasms will be felt: all these and many other symptoms will ensue, and all will generally be found in nervous derange-

ment. (We all know the meaning of the term "Nervous derangement," although we cannot well express it).\*

The Stomach thus, from its peculiar nervous distribution, gives and takes disease *from and to* all parts; and we find that the whole class of Neuroses are intimately connected with the disorders of Digestion. Even in affections of the most distant Organs, and where we would least suspect its interference we find it often concerned, though its functions seem regular. Dissections have shewn us that in almost every case of Mania the Stomach and intestines have been a principal tell-tale of disorder; and I have very little doubt, but that in inquiring into the causes of Insanity with us, we must oftener look to Indigestion. At least I think we must give the Stomach and the Brain the physical share of this malady. May not the increasing and enormous consumption of

\* See Trotter on the "Nervous Temperament."

ardent spirits in this country, afford a chief reason for the progress of this dreadful disorder? Perhaps in Scotland there is a greater consumption of these in latter days, than in any part of Great-Britain. Scotland is certainly not the land of passion; and may we not chiefly ascribe its modern increase of lunatics to this cause? Even in the Highlands of that country, and its most sequestered scenes, where the habits of the people are of the utmost simplicity, and where life presents so few excitements, (except whisky), I have observed, in a most remarkable degree, the great proportion of lunatic cases, and the great variety of the low stages of the disease.

Indeed the disorders of Digestion afford so numerous and important a class, and so much open to our view the whole Pathology of the Nervous system, that I believe the labours of the Physician cannot be more worthily devoted than to them.

Under the head of Vital power, heat has been mentioned as a constituent.—



This, however, is so closely connected with the foregoing consideration, that much discussion does not belong here to it. Although its generation, in the first instance, may belong to the other powers, viz. the Mechanical; yet we find them so dependant on nervous action, that we must rather class it under the Vital power.—The medicines entitled warm stomachics and aromatics, are merely for rousing the nervous action in the first instance. What are commonly called cold Stomachs, are merely weak Stomachs; and what is called tone is merely nerve. But how far, and in what way this nervous influence contributes to the remarkable concentration of heat which this organ shews during Chymification, we are as ignorant as of the laws of the Nervous system in general.

Thus in a general sense, although Indigestion may be referred to want of balance of the three powers—the Mechanical, Chymical, and Vital, yet we cannot well se-

parate them from each other, but may include all under the latter.

If Indigestion forms, and is connected with so numerous and melancholy a class of diseases in the system in general; and if the Stomach in particular is possessed of such pre-eminent sensibility, what an important concern in the business of our health does food constitute! Other Organs receive but indirect and often distant impressions when new substances enter the system; and they receive them through the medium of the usual communicants nerves, blood-vessels, and absorbents. But the Stomach comes into direct and almost immediate contact with such—it is constantly exposed to the touch of foreign matter—and by thus becoming the medium of their introduction into the system, is liable to constant sources of irritation and derangement.

Aliment may be considered in two senses equally important, *quantity* and *quality*.—

The theories of its appetite, or in other words *hunger*, have been like the theories of digestion, numerous; but all have assigned the Stomach as its seat. Some have assigned a mechanical, others a chymical origin to it—some have attributed it to nervous friction, others to the irritation of the coats—others to an excess of the Gastric fluid—others to the descent of the Diaphragm. These, and various other hypotheses have been in their turn brought forward, supported, and overthrown.

The Stomach, like all organs in general, must have its periods of waking and repose, excitement and collapse; but as being a nervous organ in particular, and indeed a second nervous centre, as already mentioned, these periods must be more regular and defined than in any other, except perhaps the brain. This periodical condition of life is clearly evinced by the influence of habit on it, which here, as in all the divisions of the alimentary canal, is most remarkable. Whatever *suddenly* breaks in on these periods will create or destroy

the appetite for food. If during its state of collapse it be suddenly excited, an appetite is immediately produced: sudden cold applied to the skin, and ardent spirits taken in after a heavy meal, have immediately excited an appetite. On the other hand, Opium taken during hunger has as suddenly suppressed it. The appetite however here created, is not the genuine sensation of hunger—hunger rather consists in the gradual wakening of the Stomach from its rest, in virtue of its periodical life. To define the term by saying that it is the result of whatever suddenly excites its sensibility, is surely incorrect, for the sensation produced is but morbid. Further, the influence of habit on hunger shews that it is the result of a gradual, not a sudden operation. During hunger the Stomach therefore may be said to be gradually wakening from its sleep, in order to begin its work—it continues its work a certain time, and again falls to rest. To promote therefore its healthy action, and to prevent the system being disturbed by it, or thrown too much out of its balance, we



must apportion these periods and regulate them evenly—it must commence its waking and its work gradually, & at certain intervals, and we must apportion this work to its powers. There are certain limits between these powers, beyond which it cannot exert itself; to find these limits is the great desideratum. Hunger, when carried to a certain point, collapses instead of exciting; the contrary of this if carried to a certain point, produces a morbid excitement instead of a healthy collapse.

Hence the important concern which the regulation of our food constitutes, both as to *quantity* and *quality*. The Stomach not only wakes and rests, but wakes, works, and rests; and this work is of a most laborious nature. If it does not wake regularly, it will not work well—if it does not work well it will not sleep soundly—and if it does not sleep soundly it will not be able for its work—hunger is its waking, chymification is its work, and during chylicification and absorption is its rest. According to the quantity of our food, and the regularity

of our meals, will be the regularity of these three states—the first and third of which are merely *passive*. After a very heavy meal, for instance, the balance must be thrown so much upon the second state, that the two others must be deranged, and vice versa—the work must be so heavy that the rest will be unhealthy and protracted, and the waking must be imperfect and irregular. Indeed we speak loosely when we state how long chymification takes up, so much depends on the quantity and quality of the alimentary materials. We can only guess by our own feelings and habits as to these *powers* and *periods* of the Stomach; and we all know the influence which habit has on this organ. There are many who eat nothing between dinner and breakfast, and are not much affected by the abstinence—here the periods are quite disproportioned—the rest is too long—the waking is imperfect—and thus the appetite for breakfast is little or nothing. We all vary in the strength and tone of our Stomach, and there are scarcely two constitutions that are exactly alike in

the feelings and sensations of this organ; but in a general way we all learn to know what work it is capable of doing, and what time is required in it; and thus we are enabled (if we choose) to apportion its *powers* and *periods* accordingly.

We need only consider the Stomach in any one of the three offices under which we have viewed it, to know the necessity of this apportionment. As a vital, or rather a nervous organ, we have already seen enough. In a mechanical point of view we shall see it equally strong. The Stomach may be considered a vast hollow muscle—periodical exercise is the life of a muscle, and this exercise consists in alternations of contraction and relaxation.—A Stomach long empty is like a limb long in a state of flexion—the fibres of both must be extended and exercised. A Stomach hard worked is like a limb long in an inordinate state of extension—its contractility is strained, and its collapse imperfect. In a chymical point of view, we can easily conclude that the irregularities

in the secretion of the Gastric fluid, arising from disproportionate efforts of the Stomach, must be numerous, and productive of the most painful symptoms.

To keep up therefore the proper balance between these *powers* and *periods* of this organ, is to keep up its health—and the business of this is *Diet*. Of this, the regulation of meals is the chief point.—The *quantity* of our food has as much influence in health, as its *quality* has in disease, and we all know how great this is. The way to regulate this quantity, is to regulate the intervals of our meals. If the periods of chymification and chylicification are generally admitted to be three or four hours, we can of course regulate these intervals exactly; but our own symptoms and feelings will be often our best guide, and from these alone we may regulate them. When the chyme has passed the Pylorus, the Stomach loses its great heat and gives it to other parts—the skin becomes warm, and tending to slight perspiration; this period denotes that the Sto-



mach is beginning its rest, and this rest must be undisturbed for a certain time.

It is very manifest from the above, that slight frequent meals constitute the proper healthy exercise of this organ—here the proper balance is kept up between its *powers* and *periods*. In those who eat little and often, the six agents hitherto mentioned are evenly exercised and harmonize with each other—the Duodenum is not irritated by a coarse chyme—the Lacteals are not distended by an unhealthy chyle—and the process of sanguification is not delayed or disturbed. In those who eat heavily and seldom, not only are the fibres strained in themselves, but the whole muscular coat is so dilated at times, that to regain its contractility is often difficult and always tedious. In this dilatation it presses on other viscera and displaces them—the nervous action becomes deranged—the Gastric fluid disordered—and thus not only the fabric and functions of the whole Stomach suffer, but the neighbouring or-

gans and the whole system become embarrassed.

In this country, the disorders of Digestion afford perhaps a more numerous and melancholy class than in any other on the continent. Indeed with us they may be said to present the leading class of disease. In England the business of the Stomach forms a most important concern of life; but this business is so irregularly conducted, and this organ so seldom receives fair play, that it is constantly reminding us and reproaching us with its derangements.— Huge masses of solid animal food are constantly exposed to its action, at a time when it is little if at all prepared for work—after perhaps a long state of emptiness, when the fibres, from too long rest, are completely weakened, and when the whole organ becomes utterly incapable of chymifying. Its powers being thus overstrained, and its periods so broken in upon, it in time loses its health and strength, and becomes quite unable for its proper offices.

But the effects of this species of Indigestion are not always of so chronic and patient a nature; they do not always wait for such time, but are often most sudden and alarming. I believe there are few cases wherein the Practitioners of our corporation towns or cities are more suddenly called in than in such, nor cases wherein the symptoms are more urgent or dangerous. Violent determination to the head, Vertigo, and the usual precursors of Palsy, Apoplexy, &c. The relief which purging and the lancet promise, is but temporary: the derangement of the Stomach will recur, and succeeding fits may soon put an end to the patient.

Persons labouring under indigestion, nervous subjects, and indeed a large proportion of the inhabitants of our great towns, (particularly the manufacturing) make their dinner the chief meal, and sacrifice almost all others to it. The appetite acquired for this is quite irregular—it is not healthy hunger—it is voraciousness; but

even this is not enough—artificial excitants are used. Thus indigestion begets indigestion—the Stomach, from habit, loses all other appetite but this alone—its *powers* and *periods* are completely deranged—its fabric is disorganized—and if to all this are added the other pernicious accompaniments of such meals, we shall not wonder at the train of disorders which mediately, and the fatal consequences which often immediately ensue.

The hard treatment given to the Stomach on account of imperfect mastication, and comminution of the food, has been already mentioned. The injuries resulting to it, as also to the Pharynx and Oesophagus from this, have not been sufficiently noticed by medical Authors. Mastication is a most important division of digestion, and we see its apparatus very complicated. In carnivorous animals we find the Levator muscles of the lower jaw, viz. the Temporals and Masseters, very large and powerful, and the processes



to which they are attached very prominent. In herbivorous animals we find them weak and small. In man they are in a medium, inclining to either, as his food is chiefly of the vegetable and animal kingdoms. Dilution in the saliva follows this action. The secretion of this seems to depend more on the quality than the quantity and disintegration of the food.—In the passage of the mass along the Pharynx and Œsophagus, the longitudinal folds of their inner membrane, if stretched too far and pressed too tight by crude matter, soon lose their contractility and sensibility. When the mass arrives at the Cardia, its nature ought by gradual solution to become more and more approaching to chymous matter, if not, the fibres of the Stomach, and its other agents have an extra work to perform—and thus one meal may give it as much labour as two ought to do. But not only the chyme but chyle must suffer; for although the action of the small intestines does not appear to depend so much on the

previous action of the Stomach, as the Stomach does on those of the Pharynx and Œsophagus, yet if chymification is imperfect, the Duodenum must be impeded in its work, the chyle must be more or less impure, and the whole mass of blood must participate in the disorder.

Another injury resulting to this organ, and I think a frequent one in heavy meals, is the want of drink during mastication. Among the agents of chymification we have enumerated that of simple moisture, although not one of the primary ones, yet by neglecting it we greatly injure the Stomach. The mere mucus of its inner coat, though assisted by that with which the alimentary mass is already imbued from the Pharynx and Œsophagus, together with the saliva, is not adequate to this purpose. The mechanical solution of matters of food must be well performed in the Stomach itself; and although their chymical solution by the Gastric fluid may compensate for deficiencies of this kind by

an increased secretion, yet it is putting the Stomach to a hurtful and unnecessary expence.

Food, under the head of quality, admits of a great range of consideration, but this is not the place for such. Though Man is Polyphagous, yet the quality of his food must greatly depend on climate. In our northern severe region, where the laws of life *within* have so often to struggle with the laws of nature *without*, we must adhere to that kind of food, which by strengthening the one, enables us to contend with the other. Now as in the Stomach these laws of life are so much to be looked for and expounded, as already attempted to be shewn, it is here therefore we must principally stir up the vital power—and as in the blood lies the Pabulum of the machine, we must support and strengthen it accordingly. Both these conditions must be united—it is not enough that the blood should be strong, but the Stomach must be stirred up—it is not enough that the Stomach should

be stirred up, but the blood must be made strong. The Pythagorean, or Brahminical system will not answer for us: & although the elements of nutrition abound in the vegetable kingdom, as Fecula Gelatine, &c. yet we must mix animal food with it abundantly, and often seasoned and salted. The Stomach must perform its *Elaboration*—it must be aided in its exercise and friction, heat and motion. This latter doctrine, however, has advanced too far with us, and the enormous excess of animal food now employed in this country, may well I believe, have swelled its catalogue of diseases. On this subject much has been written, and much more remains for reproof—but it does not enter into our views—it is to the Stomach we have confined our inquiries; and here we cannot say much—we have not enough learned the different effects on it from different species of food, nor the differences between animal and vegetable chyme.

The influence of drink in the work of



digestion, as to quantity and quality, merits no less our inquiry. Thirst affects the Stomach less than hunger, but is a much more powerful appetite. It is less gradual in its creation, but more acute in its character. We seldom apportion the quantity and quality of the one with that of the other. We often combine extreme fluidity of the one with great solidity of the other—a very high temperature of the one with a very low temperature of the other—we should graduate and render their properties congenial. We know that food, midway between the solid and fluid states (as jellies, soups, &c.), are often most easily chymified, and the most nourishing. Simple aqueous drinks will have little or no effect in the solution of solid animal fibres. We must apportion also the stimulus of food and drink with each other. Simple aqueous drinks give but little aid to the Stomach in chymifying high-seasoned solid food; and when, on the other hand, we dilute simple food with strong liquors, the balance of sti-

mulus will be thrown against the Stomach—it will be exerted not on the chyme, but on the coats and fibres—they will be more or less injured, and rendered schirrous, and thus the functions of the organ will be deranged.

In like manner as we have got to the opposite extreme in simple solid food, so have we in drink; and the enormous consumption of ardent spirits, together with that of our excess in animal food, may well assist I think in explaining the worst and foulest diseases that stain, not only our physical, but moral and national character. Although our organization *in general*, in being adapted to our northern and variable climate, may be of a ruder and stronger character than that of our neighbours—and although our Stomachs *in particular*, may shew this difference, yet we are always relying too much on its strength—we are always put in mind of it by its pains and diseases—and we are always reproached by them for our dissipations and drunkenness.

The effects of ardent spirits on the Stomach, and the diseases resulting from them, have been the subject of many medical Authors, and do not properly come in here. The effects also of wines, tea, coffee, &c. have been by various Writers enumerated and described.

FINIS.

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