On

The animal surfaces to which medicines are applied explaining the manner in which the action of medicines applied to each is modified by its structure, functions and relations to other organs.
Thesis
on the
Animal Surfaces
to which
Medicines are applied

by
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Scriberos si
Dixeris quid, si forte jocosius, hoc mihi juris
Cum venia dabis.

Hor. Sat. 14. 103.
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Introduction.

The action of medicines may be regarded from three different points of view. The inquiry may be proposed: - 1st. As to the direction of the action of a medicine, in other words, to what organ or tissue is its action directed? 2nd. As to its mode of operation. In what way does it operate? 3rd. What is the ultimate effect of its action on the system, or the result of the action of a medicine?

We do not mean to enter upon the consideration of any of these theories based upon the ultimate effect of medicines. One medicine is called purgative because it opens the bowels, another diuretic, from promoting a special secretion, while a third is styled altering because after its use the vital actions manifest themselves somewhat differently from what they did before, and that wherever applied. This point of consideration...
embraces the classification of medicines, and as a subject of the utmost importance for practical purposes, which has engaged the attention of the most eminent men of the profession, does not belong to the humble walks of this essay, except in so far as a general acquaintance to it may be deemed indispensable.

The subject of these papers has more immediately to do with the physiological and therapeutical action of remedies as directed by the physician's hand to a particular organ or tissue, in other words, their local tendencies strictly so restricted; opposite, we mean, to that peculiar and selecting determination which particular medicines, wherever applied, have towards certain parts of the body.

Something will be also, required to be said with regard to the second question on the mode of operation or behaviour which a medicine undergoes to bring about its recognized operation. This question the least comprehensive is undoubtedly the most difficult of the three of a correct solution. It endeavours to explain the production of effects through one or more agencies, as on mechanical (physical, vital) principles, chemical forces, or
Dynamical forces.

Passing over these with all their numerous divisions and subdivisions, and the various theories which different authors have propounded and supported to demonstrate their favourite views;—of which, by the way, the counter course seems to be a combination, that medicines act in many ways, as strongly inculcated by Cullen (First line p. 126 vol 1. 14th edit.)—the abstract and complex nature of the subject will induce attention to consider it in toto, contenting us to advert briefly and alone to the modes of communication of medicines. And for the sake of convenience of description this will be spoken of under the last head where there shall be occasion to notice the blood-vessels as direct channels for the application of remedies.

1 Hill Place Edinburgh
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The Animal Surfaces
to which
Medicines are applied.

In treating of the animal surfaces to which medicines are applied, we will be saved needless repetition and dwelling of the subject by adopting some arrangement; and as the only treatise which we are aware, has handled methodically such a subject is the excellent account contained in the invaluable work (Materia Medica) of the late Dr. Pereira, advantage will be taken in the subsequent pages, besides the excellent information contained therein, of the arrangement followed, but with the latter modified somewhat and extended.

According, then, to this proposed arrangement, the action of medicines will be considered as applied to the following surfaces:

1. The mucous covering of the alimentary canal, more especially of the stomach and recto-colic portion of the canal;
2. The cutaneous covering of the body;
3. The mucous covering of the air passages, including the nostrils, trachea, and bronchial tubes;
4. The mucous covering of various other organs as the eye, mouth, throat, ear, vagina, and urinary passages;
5. Some of the organs of external sense, especially those of taste and smell;
6. Serous membranes;
7. The surface of wounds, ulcers, and abscesses;
8. The internal surface of the vascular system.
I. Of the mucous membrane
of the alimentary canal.

Preliminary Observations - Of all the systems of the
body, which are conducive to the production of health or
the mitigation of disease, the most important is the di-
gestive tube, with its appended organs. The digestive
apparatus may be described as a long winding cylindrical
tube, running through the trunk of an animal, having
greater or less dilatations in its course and being furnished
with various subsidiary organs, possessing definite
functions, which may be arranged under three heads,—
mechanical, chemical and vital, but none of these purely
independent of each other. Of this tract, the stomach is
the most important portion. It is the organ of the body
best adapted and most commonly selected for producing
the effects of medicines. This is explained by a consideration
of the structure and functions of the canal. As to the
former, we have only to turn attention to the extensive
surface it presents — a surface more extensive than
a cursory inspection would lead us to believe; the rugae
or wavy duplicatures of the mucous membrane, the in-
numerable villi with which it is beset, are but
controversies to extend the absorbing surface of the organ without adding materially to its bulk; and the involution of the membrane which we observe in the numerous closely-packed secreting glands are no other than means to the same end. - The extension of surface, - but with the opposite purpose of abstracting from the organism, particularly from its circulating fluid, certain matters that are either necessary for other purposes, or that were prejudicial if longer retained. The tube itself, says Sir A. Cooper, is on an average 27 feet in length, and 3 inches at least in circumference, so that there are here near 1000 inches of surface from which in health continual secretion proceeds. From the measurements made by Hebbel, it appears that it covers a space of 1400 square inches, thus constituting it by far the largest secreting organ in the body. - Then as to its vascularity, - the mucous membrane is one of the most vascular tissues of the body, and consequently possessed of a very high degree of organization; its blood-vessels are so numerous and admirably disposed that its supply of a uniform quantity of blood is little modified by the most constrained positions or motions of the body, or by disease or even injuries of some of these vessels. Its epithelium, soft and lacerae, slightly adherent to
one another or to the basement membrane, and everywhere disposed in a single layer, is of the columnar form, which seems the best adapted for absorptions, and is so thin that its presence in some situations has been questioned by able anatomists. Its state of being kept constantly moist is not to be lost sight of in connection with its power of absorption; for analogy with other mucous membranes leads to this conclusion:—the inverted vagina, the prolapsed uterus and anus, plan penis, urethra, and the new columna nasi formed from the upper lip in an operation for its restoration, from dryness, friction and exposure to air gradually acquire the appearance and properties of the ordinary integuments and lose their exquisite absorbing power;—the same thing is shown indirectly in what is sometimes seen to take place with regard to neglected scrofulous children, in whom the adjacent surfaces of the navel, thighs, and other parts, transform to the modified appearance of mucous membrane... Muscular fibres longitudinal and circular surround the mucous on villous lining. These fibres, though not under the influence of the will, have various contractile or vermicular motions to the organ, and the nerves convey vitality to it.

The nerves of the alimentary canal is might be expected from the position of the mucous system in regard
to the rest of the body are very numerous, arise from
very different sources, and convey very different influences,
being connected with the ganglionic, the spinal and
cerebral systems: hence, areas that universal sympathy
which this surface possesses with all parts of the body.
The stomach itself partakes of the ganglionic or sympathetic
nerves with the neighbouring viscera: it seems to be the
centre of these, and indeed from the special influence with
the system of nerves exercised over the functions of these
viscera, it has been called the nerve of organic life. But
it likewise derives another supply of nerves from the spinal
cord, and is distinguished from every other part,
even the organs of sense, by having a pair of cerebral
nerves almost entirely devoted to it, though it is
situated at so great a distance from the brain.

The uses of this important and essential organ of the
body are to receive the food from the oesophagus, and
to return or mix, digest and expel it into the duodenum;
and along with the upper part of the gut, it serves as the
grand instrument of the bio-chemical interchange of elements
that takes place between the body and the matter ex-
ternal to it, with which it is in necessary relation.
The lower part or large intestine has for its function the
removal of effete matter from the system.
So organ, not even the brain itself, can be compared to
the stomach in respect of its complexity and relations. It is
possessed of such simple and multiplied relations.
It has been denominated by some physiologists and
physicists as the ruling organ of the body, from which
would seem to emanate an influence, that diffused over
the system, preserves the order of the parts, and maintains
the vigour, tone, and well-being of the animal economy;
and, indeed, it is a matter for surprise, considering the
usage it receives from its owners, and the many insults
to which it is subjected, that it does not more speedily
and effectively correct them. It is either immediately or
more remotely connected, in a greater or less degree, with
the slightest deviation from health, or the most trifling
injury inflicted on any part of the system, sympathis-
ing often in the most tender and delicate terms, and at
other times refusing to be pacified either with food or physic.
The maintenance of sound health depends in a great
measure on the treatment the stomach receives, and its
recovery, when lost, is equally dependent on the renovated
tone of the organ, subject perhaps to a greater number
of diseases than any other in the human body.

Immediately that a substance touches the mucous surface
of the stomach it causes the copious out-pouring of a
This fluid which is secreted by a glandular apparatus. This gastric juice is highly acid and contains beside a peculiar nitrogenous substance called Pepsine. St. Boulon thought that the reaction was due to free hydrochloric acid. But it seems more likely that it is due to Lactic acid. Such at least is the opinion entertained both by Laky and Lehmann. Thus, the result of the action of this fluid is to dissolve down the solid materials of the food, or other substances presented to it, reducing them to a thin watery pulp. This is then rendered suitable to be absorbed.

Mineral bodies, insoluble in water and in acid but soluble in alkalis, remain unaffected by the action of the gastric juice; but on passing on as far as the centre of the duodenum, they meet with two alkaline fluids. These are the bile and the pancreatic juice. We know that some such insoluble bodies pass into the blood. They cannot do so without being first dissolved. For this purpose these two alkaline secretions are well adapted. As an example of such mineral bodies, of which there are not many, we may add sulphate. It unquestionably passes into the blood, and is found there in combination with alkalis, as a sulphuret or sulphonate. It has been also, detected in the urine of those using it.
principles resembling acetum, also, require before they can be dissolved by water, the aid of an alkali. It has been ascer-
tained, too, that starch which the gastric juice slowly converts
into dextrose which afterwards changes into grape-sugar
— both very soluble — is capable of passing into these more
soluble compounds by aid of saliva, secretion of Brunner's
 glands, and the pancreatic juice. So that if any of it escape
the stomach secretion it is probably reduced to solution
and absorbed in the small intestine.

The exhibition of medicinal agents by the stomach is
technically termed the method of ingestion.

Medicines which require to come into contact with nerves
are most cordially received here, for it might be regarded,
as we have said, as the centre of the sympathetic nerves and
is intimately connected with the cerebro-spinal. Those
substances, too, which are supposed to act on particular
organs will exhibit their ultimate effects most effectively.

Such are Cantharidin, Piperia, Colocynthis, Salmis and Lapsicio. But
it should be observed that some of these are soluble in acetic acid, and if as
some have supposed, this acid exist in the gastric juice, then they might be dis-
solved in the stomach. Salsicio too not very soluble in water is easily dissolved
in a free alkali. This substance also like the last is soluble in acetic acid.
through the stomach, for it is, we repeat, the focus of action
from which nerves communicate to all parts of the body.
Thus, we see, Iodine, Bromine, Mercury and Iron tend
especially to affect the blood and the blood-making organs,
as the liver and spleen; Cinetics and Diaphoretics, towards
particular glandular organs. Of some medicines some
prefer individually different parts of the nervous system, as
opium the brain; acetic the superficial sensory nerves,
Digitals the organic nerves of the heart; and stramon-
ium those of the lungs; &c.

Very many medicines intended to act on the general
system are more widely or remotely diffused by the
stomach than by any other surface, as in the case of
the diffusible excitants: and many, too, which, when
applied to other surfaces produce only local effects, act
more remotely when injected. Tartar Emetic produces
the most violent convulsive movement when swallowed,
but scarcely shows any effect when applied to the
eye or the tongue. And a dose of opium, by acting
on the stomach, will abate both the force and velocity
of the heart, and thus affect the whole series of blood-
veins, from their origin to their utmost minute
ramifications, as evinced by the pallor of the skin,
der under its operation, as well as by its power of arresting
hemorrhage. An irritant emetic has often the magical effect of cutting short some incipient inflammations, as ophthalmia. In connection with the whole order of emetics, indeed, it seems to possess a specific irritability, and a susceptibility—unlike most other medicines—undiminished by repetition, may rather increase. The nostrums cathartics, as Senna and Castor, which though capable of absorption, appear also to act in some cases by an external irritation of the intestinal surface. They are also true eliminatives—for they are known to become absorbed; they may thus act in a double way, both directly and indirectly.

Habituated as it is also, with a great variety of substances, the alimentary surface is admirably adapted to modify the effect of medicines that would act chemically or vitally on other parts. Some substances which are known to be followed by certain results when put into a wound or injected into a vein have no effect when swallowed; they are probably decomposed or digested. Carbonic acid and sulphurous acid gases are deleterious when inhaled or injected into the blood; on the contrary they often do good when taken by the stomach. Carbonic acid thus applied is a valuable remedy for checking
counting and diminishing irritable conditions of his viscus. In fever too, it is an excellent refrigerant.

It is well known to be endowed with a peculiar power of selection of materials. This, in fact, is connected with one of its most important functions, viz., assimilation. It also perceive some modification of this property, unless it be referable to what has just been said of that occasional power possessed by it of digesting certain medicines, in the remarkable facility it comes now and again of rendering inert and harmless many substances which show poisonous effects when applied to the body through any other channel. Every-day examples might be advanced in support of this, in the high-falading dishes of the fashionable gastronomes, for instance. And we need only mention in farther confirmation thereof, the viper of hydrophobia, or what is less often for doubt the poison of some reptiles and serpents, as the adder and cobra di casrell. The poison of these so violent when applied to a wound is quite innoxious when swallowed.

Medicines which act by absorption are more energetic when injected into the serous cavities, the serosal tissue, or applied to the surface of the bronchial membrane, per se, than they are when injected.
An account of the great susceptibility of the stomach, it will not be surprising to find that the action of many medicines is varied and modified according to the amount administered or its dose. Lithic tartar in small doses excites the capillary vessels, the sympathetics, and mucus membrane, so that the secretions and exhalations are increased; it stimulates also the organic nerves, receiving the functions of the abdominal viscera; in somewhat larger doses nausea is excited, even the bowels are moved; but a greater speedily produces vomiting: while symptoms of instant poisoning and even death have been observed to supervene on the injection of an excessive dose. No better examples of the same thing could have been cited than those of mercury, opium, and strychnine: but they would have required a description longer and more detailed than would have been conformable with the length of this section.

As further proof of its susceptibility character may be mentioned, that some of those substances which have been held to be insoluble, as the metals, may be brought when in a fine state of subdivision (possibly from being within the influence of weak acids in such a state) under its control, as mercury in blue pills.
Gold in very fine powder has been used successfully in
erythroblastosis.

The rapidity of action of the arterial stimulants, prussic
acid, etc., is probably to be ascribed to their volatility or
diffusibility whereby they spread over a large surface
and, escaping neutralization by the stomach acid, are
almost suddenly absorbed and transmitted through
the blood or nerves, as the opinion may be. Prussic
acid shows this in the most eminent degree from any
surface.

There are some few remedial agents to be noticed
which are employed for the purpose of producing a
local effect on the surface of the alimentary canal,
and this seemingly independent of absorption, or at
least absorption or nerve-transmission so far as the
substance of the stomach or intestine. The best
eamples of such medicines are the irritant emetics and
Cathartics. These occasion vomiting by producing local
irritation to the stomach; purging by causing peristaltic
action of the bowels. And indeed all medicines when

* The term nerve-transmission is perhaps not altogether correct in the
present instance, considering the enlightened views which have been thrown on
the subject by a knowledge of the operation of reflex nervous action.
given in excess may act more or less as irritants on the stomach and intestines, and is strikingly exemplified when these organs are in an inflamed or excitable condition, at a time when even the presence of the handiest and most familiar articles of diet are not tolerated. It is manifest that there is a wide distinction between such emetics and Cathartics and those which are called specific; the latter show their expected action through whatever channel they may have been introduced—whether by injection into a vein or admitted into the system by any of the other methods which will be mentioned hereafter. Emetic Tartar and Epecaucan may be mentioned as good examples of the latter. They produce a nausea and depression of the heart action not necessarily accompanied with vomiting, while the nausea of the irritating emetics is rather a feeling of discomfort arising from the inverted action of the stomach.

Of the irritant Cathartics, Pile, Stanni, Metallic Mercury, hairs of Ulema purgans, act it would seem solely by irritation, and are to be expected from the different operation of castor and castor oils, Aloes, Senna, Rhubarb, which act from the blood. Some substances as Euphorbium, Camphor,
Colocynth, and Slightumux, we probably hold an inter-
mediate place. There is, moreover, a class of consist-
erant or anaesthia medicines which seem to produce a local
effect upon the sentient nerves of the stomach. Creosote,
Hydrocyanic acid, and Trienitrate of Bismuth, are very valuable anaesthia in cases of gastro-
dynia, and such-like affections.

Recto-colic portion—The lower part of the
gut furnishes the physician with a valuable surface
through which many medicines may be applied. The
mucous membrane here does not essentially differ from
that of the stomach. It is abundantly supplied with
blood-vessels and absorbers, and its numerous connec-
tions with the sympathetic nerves show that it is
not the least important portion of the gut, and that
impressions of medicinal or other agents may be
communicated to distant parts of the body. Medicines
operate nearly after the same manner when brought
in contact with the memhrane of the rectum, as they
do on that of the stomach. The difference seems to
be in degree, and in influencing particular or
neighbouring organs. It has been stated that med-
icines applied for rectum require to be given in five
times greater quantity than when swallowed, and that
five times a longer space of time intervenes before its
corresponding effects are produced: consequently that
both the dose and the interval between the administrations
should be five times as great. But this is not always or
absolutely the case, and daily experience disproves the
assertion so far: it may stand as regards such
substance as are, or require to be, digested, as vegetable
powders; but the practice would not be safe with
those which are absorbed, as Laudanum, opium and
tobacco. With regard to these last Ophelia ran into the
opposite erroneous extreme in supposing that they were
even more actively absorbed through the stomach than
through the stomach. The data are that they should
be doubled or even trebled as to dose.

In the case of medicines which operate through the nerves
as camphor and ammonia - they probably show their effects
just as quickly and with as great certainty through the ileo-
coliic membrane as by the stomach: such at all events
will be the case if allowance be made for the difference in
point of extent and surface of the two membranes.

Acrid substances will be palliated to a greater extent
in the form of injection than that of drink, because in the
one case they are digested and presented to the
membrane in a more efficient form. While in the other they are comparatively little subject to that process.

When the substances, applied to the rectum, are solid they are called suppositories; when of liquid nature they go under the general name of injections. If the injection be composed of laxative medicines, it is further particularized by the term cathartic or laxative; while enema is a formula of administering medicines or nourishment. But these terms are often used indiscriminately. Injections of the juices of tobacco have also been had recourse to as a sedative and relaxant.

Suppositories are prepared in the form of a soft pill or dose. They are generally either laxative or sedative; preparing the laxative are seldom used except in children, and the most usual is common soaps. Opium or sedative suppositories are most valuable remedies to relieve aches and distant organs, in cases where the stomach will not bear the medicine exhibited in the usual manner, and also in cases of inflammation or irritation at the lower part of the bowel, neck of the bladder, prostate gland, uterus, and urethra. The best form of opiate suppository is composed of extract of henbane.
and shrub, in quantities proportioned to the age of the patient and state of the particular case. When the solid form is found to give rise to irritation, as in some cases of disease of the gut, small starch injections containing the solution of morphia, or some other opiate preparation, should be used instead of the suppository.

Clysters are thrown into the gut by means of a bladder and pipe, syringes (Reade), or best of all, the elastic bottle and tube. They should reach beyond the sigmoid flexure, and in those cases when they promote more complete evacuation of the alimentary canal, as when frequently repeated and in large quantity, the operation should be regarded as being caused by an extension of the local irritation through the medium of sympathy. Whatever apparatus be used, the operation should be done slowly, steadily, and cautiously. Perfusion enemas should be in large quantity and pretty warm; quite or any other which it is wished to have retained should be as small in quantity as possible. barley water or thin lint-seed tea inunctions, because freer when strained, of irritating particles, are preferable to oatmeal gruel which is generally used. Clysters are commonly employed to counteract constipation and accumulation of feces in the lower gut, which arise from neglect of opportunity (in females especially), mechanical obstruction in
The verge of the anus or even much higher up, a weakened or paralyzed state of the muscular coats, and when the habitual use of enemata has rendered their continuance indispensable: such repeated employment of them, however, causing as they do, dilatation and diminution of the sensibility of the rectum are to be censured. There are circumstances, too, in which the action of common enemata are less beneficial. It is evident that they cannot be of the same service when the stomach or small intestines are the seat of disease, as when inflammation is settled in the immediate gut. It has been remarked that enemata have been more successful when the particular structure of the intestines has been the seat of disease than when the inflammation has been diffuse. It is plain also, when the intestine is so irritable that they are immediately rejected, no opportunity is afforded for producing their usual cathartic effects. With regard to the average quantity, assuming sixteen ounces as the amount for an adult, the half of that will suffice for aInfant
An ounce of castor or olive oil, and the same quantity of mandrake, with sixteen or eighteen ounces of tepid water, to which may be added - to make it more stimulating - a tablespoonful of common salt, forms a good elixir.
for an adult. An infusion or decoction of some of the
noxious purgatives may be substituted in more obstinate cases.
Turpentine injections are frequently used as enteraltic.
against the small thread worms. With the same base alone
and with (a dram or two to a pint), lime water, olive
oil, the juice of anise, of tansy, of wormwood, or of garlic,
an infusion or the smoke of tobacco, camphor tea, a
solution of asafoetida, of mercurial ointment, or of common
salt. The last not the least efficient - have been pres-
ccribed. The application of many of these may require to be
followed up by a brisk purge. Essences are sometimes
employed for carminative, and, like suppositories, for anodyne
effects. The simple injection of cold water sometimes acts as
an astringent and affords instantaneous relief in piles.
Nourishing enemata are now and again had recourse
to in order to prolong life, in cases where food cannot be
introduced into the stomach, which they have been known
to do for about six weeks. But this must necessarily
depend much on the state of health, constitution, age, and even
sex of the patient. Female, cæteris paribus, they can
live on air alone longer than males. It is not improbable
that their efficacy for that purpose has been much over-rated
from non-consideration of this matter. In the whole
enemata do not seem to be so highly appreciated in this country.
as on the continent, where they are frequently employed with
the view of producing remote curative effects. Richter and
others recommended antispasmodic emetics, to counteract
spasmodic vomiting, cardiac and, and in catlepox. Some
command objects of valerian, Passiflora, etc., to counter-
act too much irritability of the nervous system. Brunnin
lauge in large doses has been exhibited with marked success
in the same manner. Concerning the use of tartar emetic,
experience shows that if injected into the rectum, it mani-
feists its specific effects; and if this be true, why not apply
it in such a manner in preference to injecting it into a
vene, which is much more difficult and hazardous, in
those cases in which we are precluded from adopting the
usual channel, i.e. by ingestion?

To recapitulate: — the indications by which we are guided
to apply medicinal agents to the ilio-colic portion of the aliment-
ary canal are in certain of its own proper diseases; or
the contrary, iritant principle of derivation and reaction
is stimulato or irritate neighboring organs (as the uterus
bladder, prostate gland, &c.), or more remote (as distant
portions of the gut, the head); to produce alvine eliminations,
or to dissolve hardened feces; to destroy the ascariu
vermicularis; and when we are prevented from applying
our medicines to the stomach, as from indisposition,
or disease structural or functional hindering the patient from swallowing, then from the irritability of that organ it rejects all medicines, or when injected, the digestive process interferes with this medicinal action, or on account of this unpleasant taste and smell.
II. Of the Cutaneous Covering of the Body.

Preliminary Observations. — There seems from the earliest times to have been some indistinct notion that agents were capable of influencing the body through the skin. The efficacy of Poisons, more especially, thus applied was generally believed. The death of Hercules, we are told, was occasioned by his having donned a poisoned robe; and we read in the Odyssey that Circe made use of some external application for the purpose of restoring to their original shapes the companions of Ulysses, whom her spells had formerly metamorphosed into the likeness of swine. Thus was also, in those arboretious ages, a prevalent belief in the virtues of certain plants and charmed substances, the meaning of which about the person warding off diseases or cured them when present. But these were always connected with supernatural power; and there does not appear to have been any decided opinion prevalent among the followers of the healing art on the therapeutick action of remedies, when applied to the surface as contrasted with other modes of application, more especially a ventricle.

For it is altogether to be wondered at, when we consider that the most of them seemed to pay more attention to the empirical effect of remedies, rather than with a
theoretical eye to observe their proper mode of action and the different circumstances modifying it. Later, about the time of Hippocrates, when Medicine began to be a science, we are told, that frictions and motions with oil, and baths, were in common practice. These were for the most part had recourse to, and formed an essential part, in their gymnastic training: we know too, that savage and ignorant tribes are in the habit of anointing their bodies and limbs with oil; being suggested for the purpose of fortifying the body and rendering the skin supple and flexible. Though, however, this was the most frequent use under which they employed these substances, they seem to have been aware that they had a more extensive effect on the system. They were in the habit of prescribing baths of asses' milk for canstrecting debility, for the restoration of juvenility, as well as the cure of other diseases. In the practice of Hippocrates when narrowly observed, most or a great part of the principal cure of his distempers will be found to depend much on some natural means; and though these were generally in the shape of some barbarous operations or not able pieces of surgery in which the actual cautery seldom failed to figure to a fair extent, still he is said to have employed medicated frictions for the cure of menstrual complaints.
Dioscoris produced vomiting by using a mixture of bile and hellebore. Theophrastus observed that frictions upon the surface of the body with aromatic preparations, determined evolutions of similar odors. And Celsus and Diocles bear testimony to the efficacy of frictions, in the form of fomentations, frictions, and plasters. Therefore Christian is not altogether correct when he states that remedial agents were not employed for this purpose—*et il n'est fait pas les frictions avec des substances médicamenteuses, ni dans le dessin de traiter les maladies*.

At the present day most medical men, we believe, do not doubt the question of cutaneous absorption. Perhaps we should not use the term absorption, for do not a few refer it to sympathy? This is a well contested subject; but as in many disputed points—medical quod-damask into diverses contenterias will hold good in the present instance; there being sufficient evidence to prove that medicines select sometimes the one or other, or both avenues of communication. And it must be mentioned, call in question the existence of cutaneous absorption. These attempts to prove that the pulmonary organs, and not the skin, constitute the inlet through which, in the supposed instances, certain substances enter the system.
The sympathy and relations, says Christian, of the abdominal viscera and of the epigastric region with the skin are too manifest to be denied. This sympathy and these relations recognised, are we not forced to admit a sympathy and relation between the skin and the internal organs? If as many distinguished physicians tell us, the epigastric region ought to be considered as the focus and centre of sensibility, from which irradiate upon all other parts the causes of disease, why should not these same parts when diseased influence the integrity of the epigastric region and other internal organs? Such reciprocity of relation will be seen on examination of the body in the state of health and disease.

Of the sympathy between the stomach and intestines and the exterior surface we are well aware in many cases of the contagious exanthematous, and in certain fevers as the yellow and cholera-enteric. Richter insisted that in dysentery, the first indication of treatment was to promote respiration. How often is diaphoresis the consequence of vomiting? Each every practitioner must have, more or less frequently, been called upon to make use of his knowledge of that condition of function which exists between the kidney and the tegumentary surface, in correcting irritation of either and their consequences (as dermical effusions). There is a close analogy in this respect, also, between the enteric and
uterine offices. The menses, like perspiration, is a peculiar fluid, the result of a secreting action, and when secreted the vessels by which it is performed must be restored to their natural state; this is done by specific impressions of two kinds—the one by emmenagogues, and the other by diaphorotics. It is well known how beneficial the external application of warmth is in supporting or counteracting the sinking powers of life; this also by means of friction, electricity, fomentations, and cold bathing, &c., we stimulate the peripheral nerves, and indirectly the nervous centres, while by soothing the former by tepid bathing, fomentations &c., we allay the irritation of the latter. An obstinate constipation has been at once overcome by dashing cold water over the thighs.

The respiration of a person in asphyxia will often be restored by the same means; and the popular practice of slipping a cold key down the back for arresting nasal hemorrhage affords another example of the same thing. Acute ulceration of the duodenum is a frequent consequence of severe enfurcative burns—a curious fact noticed some time ago by Mr. Curley.

Moreover, absorption of medicinal agents into the system is proved by the application of a drug to the exterior of the body being followed by the usual physiological and therapeutic effects, and by its presence being detected in the...
Blood, or the secretions, by its peculiar odour, or by the most
prevailing test of chemical analysis. Castor oil rubbed on the
surface of the abdomen causes burning. Arsical ointment
applied by friction to the skin will produce salivation. Extract
of Belladonna applied to the temples causes dilatation of the
pupil of the eye. Solution of atropine applied to the skin will
produce numbness and tingling of distant parts. And if anat-
hydrate of lead be placed on the surface of the chest in case of
Pericarditis, or as to redress or blister the skin, absorption of the
fluid of the pericardium may follow the application.

Morphia, Atropine, Phosphoric Acid, Chloroform, benzoin. The
superficial nerves. Sensation augments muscular irritab-
ility, whether locally applied or administered through the
stomach. Even sulphate of lead as often quoted as perfectly
insoluble is proved to be not so. It is soluble in a solution of
acetate of ammonia. This salt is contained in the profession. Thus the sulphate when substituted for the carbonate
in some lead works at Paris, proved fatal to the
foreman who died of colic. Mr. Planchin found that
it poisoned a dog when rubbed into the skin as oint-
ment. Prof. Nesterlen of Dorpat asserts that he has
found minute globules of mercury under the skin after
rubbing in mercurial ointment. The action of a mercuri-
when applied topically to the part which it tends to influence,
is the same as that which is exerted by it on the same part after absorption. And some venereal medicines have actually been found after death in the substance of those nerves and centres which have been affected by them during life.

Lastly, we have abundant proof of cutaneous absorption in the case of contagious and infectious diseases. There exists, it is true, much discrepancy of opinion, no doubt from the difficulty of ascertaining a correct analysis of the subject; with regard to the particular and exclusive surface through which many—we might say all—of these diseases are communicated to the body, but in many instances we may point out such a channel although our imperfect knowledge cannot decide us to assert whether that be the only one. And as one of these the cutaneous surface is unquestionably an occasional medium of transference. It is said that hydrophobia has been conveyed to man from the rabid dog, by its merely licking a part of the surface of its master.

Dr. Bardeley mentions the case of a shepherd, in which the disease occurred after the common interval, though the infected dog merely licked his hand. The mode of inoculating for small-pox, as was formerly the practice in Wales, was by rubbing the poison on the skin; the disease produced is recorded to have been uniformly mild.

Again, of the other probable modes of the plague poison
absorption, that by the skin, even without breach of surface, has been proved beyond doubt. The following passage quoted from Dr. R. Williams (Elements of Medicine) is, we think, very conclusive and apposite. After speaking of the numerous victims to the plague in Egypt among the European and Arab Physicians, who were in connection with the patients, he goes on to say:—While the medical officers suffered this largely in Egypt from being brought into immediate contact with the sick, a very different fate awaited the medical officers serving at Malta and Corfu, who adopted an efficient mode of protection. The gentlemen who did duty in the Military Pest Hospitals of those islands provided themselves with dresses, either of oiled canvas, or of a material called by the Italians, tela cerata, from its pores being stopped by a composition principally of wax. The dress consisted of a jacket made to fit pretty closely with a hood to fall over the head, and layers of the same material attached to the sleeves, and this, with a pair of trousers, completed the costume. In Malta and Corfu not one of the attendants thus dressed was attacked with the disease, though constantly handling infected substances.

**For example. Various times either of the lungs or alimentary canal on both.**

† A.D. Oct. 14, 1856-26 E.
and touching the sick - they all escaped. The Forager, or
the convicts, who carried out the sick, the dying, and the
dead, from the infected houses, were equally provided with these
dressings, but the surface perspirations which followed were so
exhausting, that they threw them off, and now deprived of all
protection they died in great numbers.

Anatomy and Physiology — With regard to the
anatomy of the skin we may sum it up shortly, since we
have already considered that of the mucous membrane; for it
comprises the same constituent elements; there are only modified
in quantity and quality, and stand in a different relation to
the organism and its external objects. The cuticle in contra-
distinction to the epidermis is more horny and dry, and its
particles are flat, laminated and firmly adherent to one
another. The glands secrete mucus, not instead of sweat —
and these are proper sweat glands. The corium is much
thicker and denser than its analogue of the mucous mem-
brane, and underneath it is a layer of fat, not present, we
believe, in the other.

The skin is an organ of secretion (sudorifrons and seb-
aceous), and of absorption; it absorbs liquid, gaseous, and
capillary substances from without; and then, in alliance
with the lungs, it is the great means of maintaining the body
at the proper temperature; and associated with the lungs,
The kidneys, and the intestines, in regulating the quantity of water contained in the system. It also forms a barrier against many chemical and mechanical influences. And lastly, it is the organ of common sensation through its whole expansion.

One of the most important offices of the skin is the regulation of the perspiration; concerning which it will not be considered irrelevant to make a few statements. And first with regard to the state of the atmosphere. Warmth favours diaphoresis, cold refutes it. Warm dry air especially when in motion, promotes the aereiform transpiration by favouring evaporation. Moist air, which hinders evaporation, promotes liquid sweating. Very active exercise with the surface warmly clad produces liquid perspiration. Moderate exercise with a cool surface favours diuresis. The recumbent posture, and sleep, promote diaphoresis; the erect posture and wakefulness, diuresis. Thus when it is required to produce diaphoresis, the patient is ordered to lie in bed, to be covered warmly, and to compose himself to sleep. Anything which keeps the surface of the skin unnaturally warm, as a hot air or hot vapour bath, or thick flannel clothing, which is a non-conductor of heat—tends powerfully to cause diaphoresis. So does friction which stimulates and dilates the external capillaries. So far the condition
of sweating and of diuresis are nearly opposite. But this is not
the case with the medicines which are used to cause them.Salines
and Salines soluble in water, form the first group of true
diaphoretics. Water promotes alike the function of the skin and
kidney; and it is only by a regulation of the circumstances
mentioned above that it can be diverted from the latter
towards the former. Saline drinks are indispensable ad-
juvants to a diaphoretic regimen. Salines also tend naturally
to pass off in the urine when in small doses; but when in large
amount, by the bowels. A saline being soluble in water,
cannot pass out except into a fluid secretion; so that a
saline diaphoretic should be given in a moderate dose,
and to secure its action the skin should be kept covered
and warm and the patient in the recumbent posture.
The medicine will then pass off into the fluid sweat, as it other-
wise would have passed into the urine. Volatile diaphoro-
etics may increase the cutaneous transpiration, and pass off
by the skin, without the production of sensible liquid sweat-
ing, for being soluble in air and capable of being carried
away by it, they therefore tend especially to the two serous
secretions, i.e. those of the lungs and of the cutaneous surface.
Ammonia and its various salts are very useful as diaphor-
etics. Volatile oils are less energetic, for they often pass off with
each case as not sensibly to increase the secretion of the skin.
When pruritus diaphoreticus has been excited, care should be
taken that it be allowed to subside gradually, or the con-
sequences may be hurtful. It may be remarked that
cleanliness of the surface, by which the sudorifics ducts are
kept open and healthy, is highly important to the proper
function of the skin.

General consideration of the mode of application.

Medicines, applied to the external surface, act remotely
and topically. Medicines are applied to the skin most
commonly for the management of local affections. Local in-
flammations are thus combated. The alleviation, or even
sometimes removal, of the torture of neuralgic and allied
affections by analgesic applications is a good example. But
no better could be mentioned, if the exclusive excellence of
this plan, from the success with which it is attended in dis-
cussing and removing the chronic enervation of various
organs. This may be accounted for, because it may be
presumed that we will have more chance of altering the state
of the capillaries or nervous ramifications of the part, on
which the pathological condition is supposed to depend, and
barring it back to health, by applying our remedies
immediately to them at a distance from, the affected part.
If there be an affection of the stomach, it will be treated
best by internal medicines, unless contraindicated; but
if the disease be towards the surface, the skin evidently is
the most eligible and preferable channel for the purpose.

Medicines probably act remotely with less activity per
centage than when injected, from the cutaneous nerves (of
the cerebro-spinal system) being of a less important
nature as regards absorption than the sympathetic; and from
the intervention of the cuticle, which is of low organization.

Mercury, Croton Oil, Iodoine, and Strychnine are frequent
ly employed dermally for their remote action at the present
day. But more of these hereafter.

As compared to the dose required in the method by in-
jection, the dermial requires to be greatly increased. Some
writers say that the latter latter twenty times a larger quantity
of medicine, and twenty times longer time to act. But this
is too definite. Sometimes a larger quantity is necessary,
and sometimes a smaller. Besides the mode of application
will modify the result: and in resorting to the epidemnic
method attention should be paid to the place of application
and the greater or less thickness of the skin.

We will go on now with the more practical bearing of the
subject. There are four methods of applying medicines to the
cutaneous surface: to wit, the Euphendemic, the Lateral-
epithel, Endemic, and Inoculatine: and these will
now be considered seriatim.
The Epidermic method is the exhibition of medicinal substances to the skin without resorting to the addition of aid of friction. Blisters, plasters, ointments, liniments, lotions, poultices, fomentations, baths, fumigations, etc., are thus employed.

In general, the substances to be absorbed must be presented to the skin as much as possible in a state of solution, or suspension in water or oil. The applications should be made on the most permeable parts of the body, or the most supplied with vessels absorvent or conveying: as in the upper and inner side of the thighs, and superior extremities.

Plasters, blisters, fumigations, and baths, have a more extended power of action over the system than poultices and simple fomentations or lotions, and are often employed for their derivative or revulsive effects. Some plasters are supplied for the purpose of gently stimulating the surface, in cases of chronic pain, coughs, etc.

Blisters, according to the substance entering into their composition, may be made to operate as stimulants, disinfectants, subcutaneous, alteratives, anaesthetics, and antispasmodics. They are employed commonly for producing counter-irritation; the nature of it being but ill understood. A powerful
impression on any surface of the body, external or internal, seem to be capable of arresting and diverting, as it were, the attention of the system, and thus, for a time, of checking a morbid process; but they are not simply counter-irritants, for they also drain away the serum of the blood. It is not now within our province to consider such an action on the skin, any further than for the purpose of stating that it seems to operate on the same principles as we have seen similar local impressions on the mucous surface of one part of the gut do on another more or less distant; for example the lower portion on the stomach and commencing intestine.

Active blistering are contra-indicated in very young children, and in irritable constitutions, and where there is a tendency to disease of the urinary organs; in the first and second instances they may give rise to gangrene, and in the second and third to aggravation of symptoms. Indeed one of the peculiar effects of lanthaniudes is to cause strangury. Moreover their use is dangerous in certain inflammations, as inflammations of a spreading or suppulsive character, in some exanthemata ves. Cataractae or pustules areulant or eminent local remedies, applied for the purpose of procuring resolution in cases of local inflammation by soothing and allaying the irritation; and also to hasten the maturation of phlegmous abscesses.
As the beneficial effects of poultices greatly depend on the heat and moisture, this use may be frequently dispensed with by applying a thick fold of lint, dipped in warm water, over the part, and covering it with oiled silk, which is a lighter and more elegant application than the ordinary poultice, the preparation of which is more frequently left to the nurse. Still the medical practitioner is not to despise the humble occasion of making a poultice, for it offers an eligible means of applying more active medicinal combinations. Ointments, liniments, lotions, and fomentations, are named according as they are of a fatty, oily, or liquid nature. With few exceptions they are regarded as local agents, and are applied to ulcers, carbuncles, swellings, &c. Still some are tarter emetic and sugar of lead ointment, and such as have had some of the more potent alkaloids, &c., introduced into them, are had recourse to for more remote effects. Belladonna painted round the eyelid causes in an hour or two an extraordinary dilatation of the pupil, and is perhaps as good an example as could be specified in favour of the mode of application and kind of effect we are now considering. But from the whole it must be admitted that the quantity of these substances taken into the system is very small by the epidemic method; and to prevent repetition it may be necessary to anticipate the insensible mode by mentioning in this place that most of these forms of external application act with
much greater rapidity and energy when aided by friction.

But as we must not leave this division without advertting to the
new method of treating ascites by the external application of diure-
scetics: in which a remarkable proof is shown of efficient
absorption of such remedies. There is an able and concise
paper on the subject by Dr. Mitchell, who introduced the
practice in this city, inserted in the Monthly Journal of
Medical Science, for October 1850. In this disease we
often fail to remove the ascitical distention by the ordinary
means of diuretics or diaphoretics administered internally, or
the more reliable one by purgatives; or by mercury, iodine,
etc. In such cases the external application of diuretics has often
succeeded. The best mode of trying the treatment is to make
an infusion of Digitalis, four times the pharmacutic
strength, and apply it continuously by linen cloths covered
with oil-silk to "impede evaporation"; or what is better
still by the late invention of the texture called "Phorqio-Plaine"
used as a matrix, a large layer of which is coated moder-
ately with a strong infusion (Digitalis Fol. 3g: Aqua
ebull.: 2xxx) and applied to the whole abdomen. But
it must be stated that there are cases in which this medica-
tion signally fails, probably because our pathological
knowledge of the disease, which in fact is known to be a
symptom or rather sequel of various organic diseases,
is very imperfect and therefore fails to enlighten us of what should be the most appropriate treatment in individual instances. But so far as is understood it seems to have been most successful in cases of simple ascites. It has likewise been tried with success in a few cases of obstinate oedema of the limbs, in connection with general anasarca and Bright's disease of the kidneys, after diaphoretics, purgatives, and diuretics internally, had failed to give relief. In such cases of course we would apply the medicated sponges biline to the limbs.

Baths may be divided into general and local, and these again into cold, shower, vapour, hot, tepid, and medicated. It would occupy too much time and perhaps be somewhat out of place, to enter fully on the extensive subject of baths. It will therefore be cursorily touched on and only so far as it relates to our subject.

Bagnios was a method of cure very much trusted in by the ancients, and Pliny tells us that Cleopatra was first in bringing it into use. The public baths of ancient Rome, built by her Emperors were among the most magnificent of her edifices, and as common were they in those days that even the private houses in the country and villages bosom of their costly baths. The vestiges and monuments of these still remaining inform us of their having been most luxurious edifices.
Bathing was very much used by the Greeks, as well as Romans, as also by the Egyptians, as Pausanias Almaine relates, as likewise Caelius takes notice of the same practice, and Aesculapius was said to improve it very much in this knowledge that he almost discarded the use of all inward medicines. We are told that Avener, a Greek physician, who was the first to describe the nature of the oesophagus, proposed the use of both of milk, or other nutritious fluids, to support the patient's strength until he was able to relieve the obstruction. Leuciphanes makes mention of an interesting case of a patient labouring under structure of the oesophagus, who, for the space of two months, was unable to receive anything, either solid or fluid, into the stomach. He was tormented with thirst, and complained much of inability to make water. But all these symptoms were effectually removed, by the employment of the warm bath for one hour, morning and evening, thirst being allayed, and a natural quantity of urine evacuated. We read, too, in authentic sea narratives of individuals, who, being shipwrecked and cast on deserted islands, and exposed to the melancholies of a tempestuous season, to intense fatigue, and great deprivation of both food and drink, have allayed the craving of thirst and saved life by bathing frequently in the sea, or even putting on their clothes wet and soaked.
immersion in the sea (Capt. Bligh's Voyages, for instance.)

The medicated baths are generally those of a local kind, as the demulcentium, caudalium, bath, and pediluvium.

Among many continental writers Richter especially commends baths as a convenient vehicle for several medicines — as a means by which the most powerful remedies can be introduced into the system — he thought to be the lymphatic vessels [?].

Auricles and astringents have been principally administered in this way. In like manner he praises baths, as also lotions, as being very active in which a decoction of Peruvian bark has been dissolved — more especially if its internal use has been contra-indicated. Dr. Alexander has related a case ofague which he cured by the use of pediluvium of the decoct.

tanchean. The disease returned and was again removed by the same means. Bartholomus among others bears testimony that their effect is the same when applied externally as internally, for he says if weakly children are bathed with a sponge soaked with tepid wine, they acquire new powers, and as soon as they become intoxicated, a tranquil sleep follows. By this has shown the specific effect of mercury when applied in this way from the efficacy of baths in which corrosive sublimate has been dissolved against syphilitic diseases. He was in the habit of prescribing pediluvium of this kind (Corros. subl. ♂; s. ♂ aquae cl xxx) to persons labouring under purorhea, seborrhoe, and swelling

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of the inguinal glands. They were continued twice every day for one or two hours; after the third day both the effect could be already noticed in the soreness experienced at the teeth, and after the fifth the condition of the cavities was much ameliorated, salivation commenced after the seventh, the cavities healed and the ulcers were improved. The salivation continued to flow profusely through the eighth day. Cloquet experienced the same thing, for after (about 5 O'Clock P.M.) he had frequently immersed his hand in a concentrated solution of corrosive sublimate in which some anatomical preparations were kept and having paid no attention at the time to the immersion (manganum lotion), he suffered about one O'Clock on that night acute pains in the epigastrium, with nausea, vomiting, and other symptoms of the poison. Cloquet recommends a vinegar bath as an antidote against poisoning (9). The ancient also have observed the effects of purgatives produced when applied in the same manner as when swallowed. For in the testimony of Hippocrates and Galen they were in the custom of prescribing a pediluvium in which Hellebore had been dissolved, for producing alvine evacuations. Hunter mentions that many men who had worked in warm mineral waters with naked feet were observed to labour under diarrhoea. (Fock). The effects which follow the continued use of nitro-salicylic baths afford abundant evidence of the absorp-
tion of chlorine. They are weakness, occasionally fainting, restlessness, and nervous instability, a coppery taste in the mouth, increased flow of bile, and perspiration, the urine also acquiring the characteristic property of destroying vegetable colours (Bell).

Fumigations or substances applied to the body in the form of vapours. Sulphur fumigations have been occasionally employed with considerable benefit not only in cutaneous affections but in more deep-seated maladies. In Eczema, Impetigo, and Lepra. In the case of Eczema and Impetigo the fumigations (and internal administration) are preferable to the ointment, as this is apt to increase the existing irritation. Dr. Burgess has found sulphur fumigations (and ointment) to be very useful in Pso-
siasis palmaris. It is generally supposed that sulphur pro-
duces its result in scabies by mere external agency in causing
the death of the Scabies or itch insect; but from
the circumstance that it has proved beneficial when given
externally, as well as the fact that this disease has often an
idiopathic origin, there is reason to believe that it may exert
an action of a specific kind also in this disease as well as in
others. The same fumigations have been alleged to prove successful
in curing Rheumatism, Palsy, and serpulous tumours — and the
effects produced have been attributed to absorption of a portion of
the vapours.

Fumigations of Mercury have been much employed in the treat-
ment of syphilis. The native practitioners of India are in the habit of resorting to this method, and report the cure of many cases of syphilis and chancrea by it. Salivation is often produced. Mr. Abernethy has also borne ample testimony to its efficacy. His plan is to place the patient in a vapour bath, in a complete suit of under garments, with a cloth covering the bath, with a piece of the ray or statuette of mercury on a hot iron, placed within the bath. The patient remains there for fifteen or twenty minutes, in which time the body becomes covered with a white powder. He is then put to bed in the same clothes, and lies in them till next morning, when he enters the tepid bath. Mr. Abernethy particularly expresses this as the most gentlemanly way of curing syphilis, and adds that he has been salivation produced in forty-eight hours by it. When it is desired to put a stop to the disease rapidly, this mode is particularly applicable and advantageous, and where the body is so covered with general eruptions that no room is left for the ointment to be applied. (J. T. Thomson - Dat. Med.)

The juices of etholene, nitric acid, pungent, etc., have been used but chiefly for local effects.
CHAPTER II

Jatuleptic Method

Jatuleptic medication or the application of medicinals to the skin aided by friction is as old as the days of Hippocrates, but with the exception of the habit the profession has long practiced of introducing mercury and opium by friction, the method long fell into disuse until the subject was again in modern times brought into public notice by Bacca, Chiariotti, but chiefly by Christian of Montpellier in a work published about forty years ago. De la Methode Jatuleptique. And since his time his method has received a fresh impulse from the favourable report of M. M. Albert and Dimier, and other authors of this and foreign countries.

In having recourse to the Jatuleptic plan it is necessary, as in the epidemics, to make selection of such parts of the body as are protected by the thinnest cuticle, and which are most supplied with absorbent and other vessels — as in the subcutaneous region, inner part of the upper limbs; in the neighborhood of joints; and the chert cavities, as on the chest, abdomen, peritoneum, and over the vertebral canal. To choose the part which has the most direct communication with the organ affected: to reduce the substances which we are about to apply to the finest possible state of division, and to incorporate or dissolve them in the most appropriate vehicle, as water,
spirit, oleaginous or fatty matter, gastric juice, saliva, or even bile: to cleanse the skin well so as to render it more permeable, or even to moisten it for an hour or so before application: and lastly, to drive in the remedial particles and augment the force of the absorption by friction, judiciously managed and sufficiently long applied. We are told that the dose should be two, three, ten or twenty times as great as the ordinary dose of the medicine when swallowed; and that the frictions should be made in the evening and night in preference to the day-time or morning, because as Chrestien explains it, dans le premier cas, les mouvements toniques sont dirigés de la périphérie vers le centre, et que dans le second, ils ont lieu au contraire, du centre vers la circonférence.

We will now take a summary glance at some particular medicines that have been used according to the method under consideration; and then conclude by stating some of the objections which have been advanced against it. The advantages that are derivable therefrom will be reserved until a later occasion, when a general resume will be taken of the method of cutaneous medication as contrasted with the methods which have been already discussed.

Mercury. There are numerous experiments recorded of the efficacy of this drug when applied by frictional medication. The ointment and plaster soon excite salivation, and small
quantities of corrosive sublimate have produced violent salivation and the peculiar effects of the metal. Prof. Lyne relates a case where a solution of the nitrate was rubbed by mistake on the lips and throat. Intense pain immediately followed, the urine was suppressed for five days, and on the third salivation commenced became very profuse, and was followed by desquamation of the lower jaw; but the patient ultimately recovered.

Iodine. The remarkable effect upon the absorbent glands and other glandular bodies may be obtained by rubbing it in the form of ointment into the chin (V. Christie). It is also very efficacious as a paste in the form of tincture; indeed its effects seem to be diminished by incorporating it with lead or any oily menstruum. It is well known that this instant remedy when long continued (and especially in the cases in which an internal administration is combined) causes a deterioration of the blood, followed by an emaciation of the whole frame. So rigorously was this medicine used by the Swiss practitioners after its first discovery, that serious consequences, as the absorption of the mammae or the testes of healthy individuals are said to have ensued in such cases. But such mishaps, we suppose, will be rarely met with now.

Antimony. Partly emetic usually produced only a local effect, yet under certain circumstances the constitutional action has been developed. T. Christie mentions a case of an
infants, who, after having the spine rubbed with the ointment, died with the most violent constitutional effects.

Arsenic. This virulent poison has produced serious and even fatal mischief when applied to the common integuments, and often with a certainty and rapidity not surpassed by its effects when taken internally. It is observed to produce in these cases the signs of irritation in the stomach. (D. Christian)

Aconite is a powerful anaesthetic to the superficial sensory nerves. When applied in solution or ointment to the surface of the skin, it produces first some heat and tingling, which is attributable to a derangement of the nerves influence, and this succeeded by perfect numbness and sensation of cold, which endure for some time. It is thus a most valuable topical remedy in true irritative Neuralgia, i.e. dolorousness. When Gunnine and all internal remedies have failed, the tincture of Aconite, or an ointment containing the alkaloid, will in most cases, if applied to the part, effectually relieve the pain. It is applicable in local irritative pain at any part of the surface, as in Sciatica, Lumbago, or a Soreness of the breast that has not opened. But like other local anaesthetics it is of little service in cases of inflammatory pain, for this, when local depends upon an active cause, and could be liable to be increased by the rubbing, which in itself might be intolerable—required in the application of the Aconite.
Lead. The instances of poisoning from the external application of lead and its preparations are few in number, and by no means satisfactory. Compositors in printing offices are liable to a partial paralytic of the hands and arms; and Dr. J. Thomson has heard of a man, who was in the daily custom of handling pipes of lead, and loading carts with them, having twice suffered from this disease.

Tonic. Berthollet has recorded seventeen cases of ague, which he treated with the happiest success by the mixture of quinine, either alone or combined with the mixture of rhubarb; and makes mention that many medical men in his neighborhood (Montpellier) had communicated to him that they found the external application more useful than the internal. It proves exceedingly beneficial in cases of debility complicated with local excitement of the digestive organs, and where consequently the internal administration of quinine would have been injurious.

Diuretics. Jatralactic writers have found powdered digitalis, suspended in salver and rubbed on the outside of the arms and legs and thighs to act as a diuretic; and they recommend it in hydro-thorax as being more safe and not less certain than the ordinary method of administering it by
the stomach. In one case the attendant who performed the
frictions became similarly affected.

**Narcotics.** Every one is acquainted with the relief which
is frequently obtained from the external use of opium, espe-
cially in superficial inflammations and painful swellings,
but we have also reason to believe that internal disorders
may receive much benefit from the same means.

Dr. Burns (Midwifery) states that he has seen the vomiting
which generally accompanies flowing, restrained by
applying a cloth dipped in laudanum and camphorated
spirits of wine to the whole epigastric region. Belladonna
besides the usual effect, which we have mentioned before
it shows in dilating the pupil, has been employed to
relieve the pain of external inflammations, as that of
cuts, and neuralgic affections, being smeared in the
course of the nerve in the last mentioned cases. The
decocation of tobacco has produced vomiting when applied
to the epigastrium or scalp. Its sedative and relaxant
effects have been taken advantage of to allay irritative
cough, painful urethral affections (rubbed on perineum),
and to reduce hernia. Sir A. Cooper has related a case
in which death was produced from the application of
tobacco juice to the head as a remedy in typhus.

**Purgatives.** In certain observations are numerous
on the effect of Colocynth. Albicat produced in his own person colic gripes and headache by frictions with jalep, Colocynthis, and Calomel. Dr. A. S. Thomson asserts that jalep united with hard and rubbed on the skin causes severe griping, although when injected into the vein it produces no effect; and that the bowels of children may be readily affected by rhubarb applied to the abdomen in the form of Jillottee.

Owing to the great impediment which the morganized epidemicus unquestionably offers to absorption, the following objections have been raised in respect to the Jalaletic method of medication:—that we cannot hope for certain results by it, except in the case of infants and delicate females, in whom the integuments are thinner; that it requires a long and tedious attention before it affects the system; that the process is extremely unpleasant and a source (from the long friction requisite) of great pain to the patient; and that it is liable to cause much local irritation or even superficial inflammation.
III. Endermic Method.

The endermic method of administering remedies consists in their application to the denuded dermis, when they penetrate by imbibition into the cellular interstices and are brought into direct contact with the venous and lymphatic capillaries and the termination of the nerves.

The dermis is well known to be a highly absorbent tissue, and we have already called attention to the remarkable resemblance between it and the inner membrane of the alimentary canal, a resemblance which was stated to have led some anatomists to consider the one as a modified prolongation of the other.

We are indebted for the systematic employment of this plan in the treatment of disease to Simbert and Levis. The results of Simbert's observations are detailed in an "Essai sur la Methode Endermique," read before the Royal Academy of Sciences, Paris, on the 20th Sept. 1825. This writer confessed that he had been led to adopt this method from several accidental applications which had already been made of the kind, as from some of Mazzendier's beautiful experiments, and some observations by Murray, Bally, and Siméon. The denudation of the dermis may be effected by the
operation of a blister, a plate of heated iron, the moxa, or by boiling water. Of these the first is the best. If the topical action it produces be too irritating, it should be incorporated with essence, gelatine, or an emollient cataplasma. Rayé has found that he could remove the cuticle by this means without his patients feeling it. Of course in these cases we will augment the dose proportionate to the amount of the vehicle. Tronseau recommends a vesicating ointment, composed of equal parts of a strong solution of ammonia and lard. Boiling water is objectionable as a means of removing the cuticle, because its action is uncertain, limited, dangerous, and very liable to induce inflammation and death of the surface, which renders it no longer capable of absorbing. The disadvantage of the operation of raising the cuticle by means of the moxa or heated iron will be presently seen. Lumbert advises that when the blister is raised, and the epidermis elevated by a lumped fluid that an opening should be made into it, so as to permit the serum to be discharged, and the substance in the form of powder, solution, ointment or plaster laid over it, to be introduced. Absorption he conceives, goes on less actively when the dermis is completely deprived of its cuticle. The reason is not very obvious unless we
admit that the contact of the air produces upon the mouth of the denuded absorbent vessels a constriction analogous to that which it effects on the extremities of blood-vessels. It is necessary in repeating the medication to remove with great care a thinning or epidermoid concretion which is produced under the cuticle, for this purpose the chloride of lime may be used. When inflammation manifests itself in a slight degree absorption often progresses actively, but when it (inflammation) goes beyond that limit, the absorption will be in an inverse ratio to its intensity.

With regard to the parts of the body that are to be preferred for the applications, they are not different from that was stated in the foregoing forms; there is perhaps more room for choice in the present.

Should the amount of medicine applied have been too large, and outward symptoms arise immediately since the blistered spot and cleanse it; then have recourse to any substance which will neutralize the poison or suspend its effects. Lemberg has put a stop to tetanic spasm which had been provoked by two grains of strychnine, by substituting on the same surface two grains of acetate of morphia. We might profit by the proposition of Dr. Daniel Barry, and apply a cutting-glass
over the absorbing surface. Mr. Bonnland has been con-

firmed in the blistered surface prove equally effica-

cious. The substances which Lambert has most partic-

ularly examined are morphine, strychnine, and guinea;

but he has also made some observations on sulphuret of

antimony, musk, bismuth, saffron, emetic tartar,

belladonna, quill, and corrosive sublimate. The effects of

these medicines applied in the manner that has been de-

scribed are of two kinds; the first, local, consisting of an

irritating sensation accompanied with redness, and

injection of the denuded surface, varying according to the

greater or less irritating property of the drug; the second,

general, due to absorption, developing itself in two minutes,
or one, two, or three hours, and usually attended with a

feeling of warmth along the course of the great vessels

and nerves, leading from the part affected to the next

gastric cavity. Mr. Lambert has universally found a

great degree of local irritation to be most favourable

for the production of the constitutional effects.

The local action of morphine is limited to a slight

temporary sensation of itching; but its constitutional

operation is well marked. Pain, wherever it exists, is

almost immediately lessened; the pupils are contracted;

there is sclerosis, sleep, coma, or other head symptoms, the
pulse is diminished in frequency; less bronchial exhalation, itching of the skin, and sometimes eruptions. But its great distinguishing peculiarity, and the one which renders it so far superior to the internal use of opium, in many cases, is, that the stomach remains totally unaffected. The dose required to produce full effect is about 1/2 or 1 grain, but he begins usually with 1/6 of a grain — a large dose at first rendering the patient uncomfortably susceptible of even very small quantities. The topical effect of strychnine are still less marked; it manifests its constitutional action in about two hours, which in no way differs from that produced by its internal administration, and is no less effective in the cure of disease. The advantage of this plan is most obvious in the case of lead-palsy, where the cause of the paralysis is local residing in the nerve, and not in the centre. Quinine has been used with great success in the treatment of ague; a considerable degree of general excitement speedily follows its application, and he finds it of importance that this excitement should correspond, as nearly as possible, with the time of the fit's accession. The sulphur of antimony promotes expectoration, and sometimes excites colic and diarrhoea. Assafetida
and Saffron were found useful in cases of neuralgia. Lacet's Tartar produced such violent local irritation as to be almost insupportable. In four grain doses it produces general diaphoresis and diarrhoea. He has never observed its endermic application provoke vomiting.

Corrosive Sublimate when carefully applied so as not to cause an excoriation, excited sweating, slight increase of urine, and salivation. Squirrel acted as a diuretic; and Belladonna when not too distinctly applied from the head produced its usual effects, even more powerfully than when taken into the stomach.

Conclusive testimony has been borne by various subsequent observers of the truth of these researches and the efficacy of this method, and many new cases are reported tending all to confirm it. Majendie, Gerhard, Chomel, Dr. Christian, and many others, have had recourse to it, and speak favourably of its practice; so that there seems reason to believe that at no distant period the endermic method of medication will be more generally adopted.

The disadvantages of this endermic method are alleged to be the pain which the applications to the denuded surface sometimes occasion. But this we have seen may in a great measure be remedied by proper management; the skin may be permanently disfigured, some
medicinal agents may even induce mortification of the part; lastly, some substances have no effect when applied subcutaneously.

IV Method by Inoculation.

This method ought perhaps strictly to be regarded as a modification of the last. But it will be most conveniently treated under a separate head.

The inoculative method of employing medicines was first proposed by Mons. Lasargue de St. Etienne. Trials, so far as we know, have been for the most part made with morphia, which is injected by means of a slight puncture made with the end of a lanceet. M. Lasargue considered the introduction of medicines would be a speedy and effectual way of introducing them into the system; and he communicated to the Academy of Paris the result of some experiments made on this plan. He found that two minutes after the introduction of a very minute quantity of morphia, a papule made its appearance encircled by an erythematous blush. At the end of a quarter of an hour the papule had become much increased in size, and if the punctures were
made close together there was an erythema and the papula presented a discreet Institute. All traces of the eruption disappeared by the next day. Local nervous pains, particularly those occurring about the frontal and inferior dental nerves are stated to have been immediately relieved by the injection of an almost infinitesimal quantity of morphia. Others state that they have succeeded in relieving nervous headaches by the same means. And Dr. Brouard Lesfray succeeded in removing a fit of epaomeotic asthma in a man by the injection of some digitalis which produced quickness. (British & Continental Med. Rev.)

Such flattering statements as these would certainly influence the belief that the system is worthy of further experiments, and we may be surprised that at the time of Dr. Jenner's discovery no one thought of this method of introducing medicines into the system. We suspect, however, that the introduction of remedies in the manner described would not be to the extent that it would be generally useful. In some local nervous pains where the morphia came into direct contact with the extremity of a sensitive nerve it might relieve the pain. It can be of little service in sympathetic nervous hands. And in the cases in which it is stated to have been so very successful, imagination, probably, had as much share...
in the use as the morphia.

The steps in the process of vaccination and that of inoculating for small pox, and as it was formerly practiced in a few other contagious exanthemata—now, however, discarded—are well known, require no comment here, and do not properly belong to our subject.

Comparison of the cutaneous mode of medication with the method by ingestion; and the advantages held out by the former.

When the gastro-intestinal mucous membrane is in a state of integrity and emptiness we can reckon upon the effects of the agent absorbed, disseminated on an extensive surface, admirably fitted for absorption, and one closely connected with every part of the body; and when it is remembered how numerous the diseases are which are dependent more or less on a derangement of its functions, it must evidently form the most natural and appropriate channel for the administration of medicines. But there are many conditions and circumstances which contra-indicate their internal exhibition, and render it injurious or even impossible. Then, for instance, there is some obstacle which opposes itself to the
introduction of remedies into the digestive organs; when
the stomach and intestines by reason of vicious or exalted
sensibility or natural idiosyncrasy cannot support
their presence, likewise when the patient feels an irrevo-
cable repugnance to swallow the remedies, when from the
effect of habit these actions becomes lessened or null, or
when the internal exhibition is accompanied with dis-
agreeable effects. Besides it is a good means for ascer-
taining the pure therapeutical effect of a medicine.
Without dwelling on the influence of constipation and
that lining of mucous concretion which so frequently covers
the alimentary canal and hinders alike absorption and the
dissolution of the medicines, we have only to turn our
attention to the nature of these last with the food and
the various secretions of the stomach, and we will
see that the therapeutical agent, lost amid these
chaotic matters, often undergoes decomposition which
neutralises it, or combinations which transform it into a
product, it may be, poisonous, or on the other hand,
inert. Every practitioner must have met with instances
of violent irritation succeeding to the internal use of
iodine, and been annoyed by the derangement of the
digestive organs from the employment of opium. In
each and all of these cases the same remedies may be
administered with the greatest advantage through the medium of the common integument.

The injection of active remedies by the rectum presents less inconvenience but likewise less chance of success, because it is generally filled with feces, and rarely retains for a sufficient length of time the article which are confided to it. We remark also that on account of the functions which devolve on this portion of the gut, it enjoys an absorbing power much inferior to that of the rest of the alimentary canal.

If the enemiac method be thus useful in the treatment of general diseases, it is manifestly still more worthy of confidence in the management of local affections.
Of the mucous covering of the air passages, including the nostrils, trachea, and bronchial tubes.

The above subject will be discussed under three heads, namely, applications to the nasal or pituitary membrane, to the laryngeal membrane, and to the tracheo-bronchial membrane.

a. Nasal membrane. This mucous membrane is also called the pituitary or Schneiderian membrane of the nostril. It is highly vascular, and its nerves are very numerous. The epithelium which defines the living membrane is laminated in the fore part, and in the communicating fossa and cavities covered with vibratile cilia.

Under this head should be classed those remedies which act on the membrane without influencing the nerve of smell, as some of those which excite a discharge, and those whose operation are supposed to depend on absorption or on an impression made upon the tings of the fifth pair. But as we suspect that these substances are few in number or rather, that it would be difficult to desprese that most of them do not in some degree influence the olfactory nerve, and as it would be a easy matter to draw a fair distinction between them, departing a little from our ordinary
plan of arrangement we have thought best to class them under the head of applications through the medium of the organ of smell:

3. Laryngeal membrane. We have just perused the subject of a paper lately read by Dr. Wagstaff before the Medical Society of London. It is entitled 'Topical medication in the treatment of diseases of the Pharyngo-laryngeal membrane.' It is inserted in the Medical Times for Sat. 2 Feb. 1852. Dr. Wagstaff employs the following instruments for effecting an entrance into the larynx: a bent spatula fixed in a handle, slightly conical on the under surface, so as to conform to the convexity of the tongue, and a whale-bone protractor, to the end of which a small rounded piece of fine sponge is firmly attached. By pressing the tongue firmly down and drawing it forward from its base with the spatula, the laryngeal surface of the epiglottis may be exposed; when the organ is in view, its posterior face being insensitive to touch, it may be used as a guide for the introduction of the sponge into the larynx. The tendons to be unsheathed are introduced by means of a proper instrument. Much care is recommended in passing the sponge into the back of the mouth to avoid touching the pillars or the Pharynx, as more or less violent retching would in consequence be produced, and which would preclude any attempt at
entrance for a time. The epiglottis, it is said, is insensitive on its under surface. The operation, which does not cause the anticipated irritation, may not always succeed. The first time it is attempted, as in some patients are more suitable than others, the tongue may be thicker... Dr. Wragstaff employed powdered Nitrate of Silver, etc., in the manner stated, with great success in acute and chronic catarrhal affections of the pharyngo-laryngeal membrane, and the organic affections which result from these as well as from acute and chronic inflammations of this organ laryngoscopy, stricture, hooping cough, true membranaceous eruction, and an hysterical loss of voice.

At the close of the reading of the paper several other gentlemen who had tried the method spoke favourably of it. The practice is said to have been introduced by Mr. John Bell in 1816, and Dr. Horace Green of New York. The former witnesses to its harmless and efficiency, is in the habit of passing his sponge - armed probe down into the trachea, even in some instances to its bifurcation!!!

2. Tracheo-bronchial membrane - Method by inhalation. Medicines with two or three active principles are at the present day applied to the aerial membrane with a view to their local action only.

Relating to the remote effects. - There are some physiologists who, referring the remote effects of medicines exhibited by
inhalation to the Schmerdian membrane alone, are disposed to doubt the susceptibility of the lungs and air to impressions — or at least believe that the extent of that power has been greatly exaggerated. These tell us that it is the function of the lungs to extract and throw out matter, and that nothing in the place of it is received; that miners and other workers in mines are protected against the poisonous effects of the exhalations which are thrown off in their operations, by previous to each exposure taking even a very small portion of aliment or drink; and some ascribe their fortunate protection from contagious and insidious diseases from adopting a similar expedient. But do not these two last assertions refute the validity of their hypothesis — for they imply that a removal of the protecting cause removes the new susceptibility? Besides what do we learn from analogy. We shall see hereafter — the duration of a poison is much prolonged and even sometimes rendered inextinguishable by injecting some bland fluid as tepid water into the veins. But to turn to facts. We find that many of those, who deny the existence of cutaneous absorption, at once attribute it to the lungs. That the bronchial membrane does indeed, absorb many substances with great facility, as one who approaches the subject unblinded by prejudice or unbiased by preconceived notions, can we apprehend, for a moment deny.
Accidental observation, as well as the experiments of Richet, Klapp, and Roussseau, with volatile substances, as the vapors of turpentine, camphor, garlic, yes; the speedy conveyance of mercury by the respiration of its fumes; the rapidity with which poisons thus applied produce their specific effects; the fact that salts have been discovered in the blood, the solutions of which had been forced into the bronchi; and lastly, from the presence of the anaesthetic agent being detected in the blood, say even in amputated stumps— all bear conclusive evidence in favor of this opinion. This is probably, also, the surface most frequently alighted on by contagions whereby to communicate their specific poisons to the system. The pox of typhus offers one of the best examples in point of this class.

The action of the common anaesthetic agent, chloroform, and sulphuric ether, employed daily for rendering patients insensible to pain during surgical operations and parturition, etc., are as well known as to require no lengthened comment here. Potatoes of nitrogen, and the vapors of hydrochloric and nitric ethers, of benzine, and of bisulphuret of carbon, are said to produce similar effects.

Ammonia inhaled as a gas into the lungs will relieve fainting in the same way as when swallowed. The vapors of Mercury and Arsenic when inhaled have the same physiological and therapeutic effect as the solid substances.
themselves. They mix with the blood of the pulmonary circulation and operate powerfully and rapidly. Inhaled in the form of arsenious acid, arsphenum of mercurial, and arsphenurated hydrogen, they are deleterious poisons. The breathing of poison is fatal to its exposure to be applied to the pulmonary surface is sufficient to kill. Hemlock, hydrocyanic acid, tobacco, and other heroic medicines. From the difficulty of regulating their effects, will probably never come to be administered in regular practice by inhalation. There is reason for supposing that many of these do not undergo decomposition, but are carried directly to the brain, and thence result their action on the general system. The efficacy of quinine stuffed with bark recommended in fevers; of the hops, pillow (pulvimaum Humuli) long in vogue for producing sleep; pillow of the aesculium, Felix, once too, in repute for the cure of rheumatics, and similar exploded medicaments—of efficacy they had—must have been from being inhaled.

Relating to the topical effects. Inhalation of medicines are in general made use of in various affections of the throat, in asthma, chronic bronchitis, phthisis, and other diseases of the lungs, etc.

Medicines are inhaled in the form of fumes.
vapours, or that of the substance reduced to an impalpable powder.

The last is seldom if ever resorted to. It was recommended by 6. Myddleton in pulmonary diseases. Some of the articles, which he employed thus, were cinchona, sulphate of iron, arnica, &c.

The method by inhalation, or inhalation of substances in vapours is very serviceable in many of the affections of the air passages. Medicated vapours of camphor in complaints affecting the cavity of the nose, throat, and chest, have been much handed. Vapours impregnated with sulphuric ether are strongly recommended in spasmodic dyspnoea, sandiferous catarrh, obliterative obstruc. and in hoarseness of recent or long standing. It is alleged to be very useful in consumptions. We are told that the efficacy of such applications is much enhanced by dissolving in it several substances, as bicarbonate, extract of hemlock, &c. Vapours of iodine, ammoniac, chlorine, &c. are praised by some, but we will speak of them under the next division. But of all these none perhaps takes precedence to simple water in the form of steam. The addition of a small quantity of vinegar will often be found useful. Catarhal, asth.
it seems most useful. In all of these an expectoration of phlegm occurs, which is generally difficult and attended with severe coughing and laborious breathing. The inhalation of hot water by expectorating and facilitating the process of expectoration has a great effect in relieving all these symptoms. This is remarkably the case in the asthmatic paroxysm, which may often be shortened by this easy resource, and the patient saved from a great deal of suffering. Inhalation of the vapors has also been employed in Rhypanche trachealis and Rhypanche tonsilaris, and in Phthisis Pulmonalis. In the first two, we believe, all the salutary effects will be better obtained by means of gargles and diluent drinks; in the last mentioned disease it has been found generally serviceable. The volatile alkali and its Carbonate stimulate the secretory efforts of the lungs and dispose indolent ulcers to heal.

The method by Suffusion, or inhalation of fumes of burning substances — for inflammations — introduced by the example of Sir Alexander Clinton, late Physician to the Court of St. Petersburg — are recommended in cases of chronic pulmonary disease, and the smoking of narcotic herbs (Stramonium, Lobelia inflata, and Tobaccos) for the relief of asthma and Consumption may also be
regarded as a modification of the same practice. Sulphur, Mercury and its Sulphuret, Onda Antimony, employed in the same manner, have each had their confident supporters. Chlorine, Iodine, etc., much fancied by some in several of the complaints of which we have been speaking, are rarely serviceable.

The application of medicines to the tracheo-bronchial membrane with a view to their therapeutical effects on other remote organs, with the exception of our every-day anaesthetics, is not likely to come into general practice from reasons which have been stated; nor would it be preferred to other methods in cases where we are precluded from applying remedies to the gastric-intestinal surface.
IV. The mucous covering of various other organs, as the eye, mouth, throat, ear, vagina and urinary passages.

a. Ccular mucous membrane or conjunctiva. This is a very active absorbing surface, and is supplied with two sets of nerves, sensory and special. Certain pathologists, as those who upheld that the inflammatory affection of the brain or its membranes consequent on ophthalmia of the face depends on inflammation through the optic or other nerves, have thought that contagious or infectious diseases, and the effect of certain poisonous agents might be attributed partly to the same mode of transmission.

The extreme deility with which poisons act when applied to the mucous membrane of the eye has been proved by many experiments on lower animals. One or two drops of hydrocyanic acid when injected under the eye-lid of a dog caused death almost instantaneously, and with nearly equal deility as when put into the throat of the animal. In the human subject anodyne lotions, ointments, etc., have been prescribed with great relief in certain cases of circumorbital paining — and although the applications are generally made to the cutaneous surface of the eye-lid and eye-brow, it will not be unreasonable to suppose that a portion may have inhaled itself on the conjunctival surface and produced a part of the resulting effects.
Medicines are frequently applied to the conjunctiva for
local effects. In certain opthalmic astringents have often a
magical effect in abating and removing the symptoms. Their
operation however is simple and obvious. When one of them is
applied to the inflamed eye, just as to a red ulcerated sore, that
is turgid with blood and discharged an unhealthy matter, it
tends to promote the contraction of the dilated vessels, and thus
disperses the congestion and diminishes the discharge. Nitrate of
silver in different forms, corrosive sublimate (allyrium hydrargyre)
sulphate of zine, alum, acetate of lead, are the astringents in
common use. Dr. Mackenzie of Glasgow recommends the
two first only. Corlyria or eye waters are liquid washed
applied to the eyes. In orbital and circum-orbital pain, and
then there is intolerance of light. The following anodynes have
been applied to the conjunctiva:— opium, opio, decoction
papaveri, vapours of opium, of belladonna and mixture of
belladonna. Balsam of Peru also, used in vapours, produces
numbness of the nerves, lessens redness, and clears the cornea.
A couple of tea-spoonfuls of Scheele's solution is put into the
bottoms of a large bottle, and the eye held over its mouth for one,
two, or three minutes. Tincture of opium dropped on the
eye-ball causes the pupil to contract. In internal diseases
of the eye, artificial dilatation of the pupil is often necessary, and
this is satisfactorily accomplished by the precipitates of belladonna.
Inunction, or aromatization. The Amerindus lucidus is said to have the same powers.

3. Bucco-guttural mucous membrane. - Medicine are rarely applied to the mouth and throat except for local purposes. It has been proposed to excite salivation by rubbing two or three grains of calomel, or of the black oxide of mercury on the inner surface of the cheeks and gums. The drug is quickly absorbed, and causes salivation, and if care be taken not to swallow the saliva, diarrhoea does not occur. Free evacuations are produced by merely touching the tongue with castor oil, and this mode of producing catharsis is taken advantage of in maniacal cases, delirium tremens, apoplexy, etc., when there is a difficulty of getting the patient to swallow more bulky medicines, and after the faculty of deglutition is altogether suspended. Cases of the dououlmens are said to have been relieved and even removed by a drop or two of the oil applied to the tongue.

Solids used in the mouth are called Troches or Lozenges, liquids are termed Gargar or Collutoria. Troches are composed of powders made up with glutinous substances and drunk. This form is principally made use of in cystitis and irritation of the upper part of the windpipe for the more comminution exhibition of certain medicines, by fitting them to dissolve slowly in the mouth as to pass by degrees.
into the stomach, and act upon the pharynx and throat; and hence these preparations have generally a considerable proportion of sugar, or other materials grateful to the palate. When the inflammation is violent a slightly stimulating liniment is preferable, it promotes the deteclment and removal of the phlegm.

The good effects of gargles have been much over-rated. From the straining and movements of the throat that accompany their use, they may be hurtful in inflammation of the mouth, and the different forms of dyspepsia. A good gargle and the least objectionable in these cases is one of warm milk and water. Still detergents gargles are serviceable by assisting the secretion of the mucus that collects in the faucets and in correcting the foetor. A weak solution of chloride water answers well. Stimulating gargles may often be employed with advantage in chronic sore throat.

The insufflation of medicated vapour and powders is not necessarily different from what was said of their inhalation.

c. Ear. — Stricture now and then apply wasters to the Eustachian tubes in local affections; but the occasions for the practice are rare, and the operation difficult, except in practiced hands. A very weak solution of Nitrate of Silver is recommended to be injected into the external meatus in
chronic serpuloid inflammation of the ear. Spraying with warm milk and water is a good palliatice of the pain which attends such inflammations. Polypos and other excrescences which have occasionally their seat here, when removed by the forceps, a hook and scissors, are touched with the uniodized mixture of iron, or human dextre. The external ear is sometimes sprayed with boric water for the removal of hardened cerumen, hair, small pebbles, insects, and other extraneous or foreign substances.

3. Genito-urinary mucous membrane. The vaginal surface used as a medium for medical appliances is by no means of recent date. Hippocrates used oils and juices of herbs, nitre, scammony, cantharides, alum, aromatics as coriander, carom, with other odoriferous gums and plants for softening, opening, irritating, astringing, purging, cleansing, irritating, or lengthening the mucus" (kennedy). Medieval preparations are applied to this membrane with a view to their local effect only. In sexual diseases of the vagina and soute injections of an astringent or cleansing nature have been employed to correct these and diminish the discharge which is generally present. Injections are also made to excite the catamenies, to relieve dysmenorrhea, and in pregnancy to excite the uterine to contract and stop hemorrhage. Dr. M. Lavagna of Italy, proposes
The injection of ammonia as an emmenagogue, and general fourteen cases of amenorrhea in which the practice succeeded, sometimes in twenty-four hours, and at most in five or six days. He says that it not only produced the discharge but removed the paleness, oppression, difficulty of breathing, anorexia, weakness, etc. The injections are usually of liquid consistence, but Dr. Perreau mentions a case in which carbonic acid gas was successfully employed to relieve an internal uterus. The only wonder is that other anodyne substances are not more frequently resorted to in the same state of the uterus. Might not opium, or better, a weak injection of chloroform, be advantageously administered in such cases? And the supposition may not be accounted rash which anticipates an even more extended plan of treatment when experiment and experience shall have been brought to bear on, and taken advantage of, the knowledge of the exquisite and extensive sympathy which the stomach and intestines, the nervous and vascular systems, exhibit with the uterus and the organs in relation with the membrane under consideration.

Poisons are quickly absorbed from the vagina; and those which act by nervous impression are no less rapid in producing their results. Two cases are on record of poisoning occasioned by the introduction of arsenic into the vagina. (Dr. Christison.)
Mr. Sumner found in his experiments with prussic acid that death was produced as instantaneously when the poison was placed in the vagina as it was when swallowed.

We will now review shortly the affections and diseases in which medical practitioners have been had recourse to the vagina-uterine membrane.

A. There have been generally in cases of diseases of the vagina and cervix uteri, and— with the lesser exception of caudic applications, or even the actual cautery, which may be applied to the part afflicted without injuring the vagina—are in the form of mate injections. In such disease injections may be thrown up by a syringe or some appliance of the kind (cylindrical pipe and bladder, elastic bottle, etc.), or conveyed to the part by means of a curved glass as recommended by Dr. Montgomery. Solutions of alum, sulphate of copper, or zinc, acetate of lead, nitrate of silver, acetate of morphia, decoction of poppy heads, extract of hemlock or of belladonna, oxyurate of mercury, or astringent decoctions, may thus be applied to the part afflicted. In milder cases injections of warm or cold water may be advantageously employed. They

* Nitric acid, sulphur of antimony, nitrate of silver, etc., have been applied with great benefit in fungous growths, ulcerating affection, and inflammation of the cervix.
should be used for the space of one or two hours at a time, and if possible twice or thrice daily. It will scarcely be necessary to add that the injections should be administered slowly and in the recumbent posture.

A. Astringent vaginal injections have been used with advantage in chronic vaginal leucorrhoea: in menorrhagia injections of tepid and afterwards of cold water; should these fail, the more active astringents are tried, but rarely last they determine a noticeable action to the part; also, in the hemorrhage which is so apt to follow the removal of uterine polypi; and when in connection with the weight of these the uterus has been dragged down. Sir Charles Leland says he succeeded in arresting the progress of two cases of cauliflower presence by astringent injections, and the treatment is supported by numerous authors. In cancer of the uterus, to check the hemorrhages. In some of the displacements of that organ, to aid to restore the tone of the vagina.

B. In the following affections appropriate injections have been employed with a view to their emollient, cooling or anodyne effect. In granular inflammation of the mucous membrane of the cervix uteri; simple ulceration of the cervix uteri; in the removal of polypi from the cervix uteri; in the removal of polypi uteri by ligature each time the ligature is tightened; in advanced cases of cancer uteri they are much recommended, for besides affording temporary
relief by assuaging the pain they deprive the discharge of its fetid odours, moderate its amount, and are said to be beneficial in restraining the hemorrhages. Prof. Slogf of Genoa has injected carbonic acid into the vagina in cases of inflammatory dysmenorrhcea; it is said, with great relief of the pain and a more regular menstruation subsequently.

5. Vaginal injections will be advantageous in all cases in which the secretions of offensive discharges or gases are apt to be excessive or accumulate in the passages. A few emulsions will suffice— as in cancer of the uterine cavity and after the ligation of polypi, as already cited. A good deal of benefit may be expected from vaginal or uterine injections of nitrate of silver in uterine tympanities; its antiseptic properties are as marked as its power of changing the morbid action going on on uterus membranes.

7. Stimulating injections into the vagina have been tried with success in chlorosis, as far as inducing the catamenial discharge. The ammonial injection composed of one drachm of the purer liquor ammoniac to a pint of milk, daily injected into the vagina, has proved very efficient in the hospital (Shewell). Dr. Blundell speaks favourably of vaginal injections for the purpose of causing development of the uterine function in simple amenorrhoea.
The application of belladonna has been strongly recommended for the purpose of assisting the dilatation of the uterus in labour, prostrated by spasm of the heart. It is, however, better applied in the form of extract.

B. Injections into the uterus being a very hazardous practice have met with few supporters. We have already adverted to it as advised by Lavagnia as a mode of local irritation to determine the development of the menses in amenorrhoea. Lavagnia and Acher recommended a lotion composed of a few drops of bignammonoe to an ounce or two of milk. Dr. Mitchell succeeded by it in one case.

Dr. Blendell speaking of menorrhagia says in the worst cases of passive menorrhagia (i.e. when the discharge is large, and occasionally mixed with clots of blood) there is another remedy - first recommended to me by Dr. Haughton, and which I have found of great value, and that is the injection of strychnina, not into the vagina only, but into the uterus itself; and this has been known to succeed in cases apparently desperate, where the bleedings have long gone on till the patient has been reduced to the most extreme degree of weakness. Simple water may first be used, and, if this fail, half a drachm of alum may be dissolved in half a pint of water, and used for the purpose; for you must not use for the inner membrane of the womb, solutions.
of the same strength you would employ for the sweet membrane of the vagina, unless by advancing gradually from the weaker solutions to the stronger, as the parts may bear. Hence in the day, the injections may be made; one small gush of about two tea-spoonfuls, may be thrown up, then a second, then a third, then a fourth, in succession, and so on till you have thoroughly wet the uterus, care being taken that you do not inject too forcibly, as this may tend to irritate the vessels, and increase the disease. Under the use of the alum, you will find perhaps, that in the course of two or three days, a quantity of clotted blood will come away, with pains, something like the pains of parturition, and which may alarm the patient. This is nothing but the blood coagulated by the alum, and may be regarded as rather favourable than otherwise, as it shows that the injections have been truly thrown into the womb, and that the uterus is contracting. (Diseases of Women p. 283).

So much for this heroic method of practice which we believe remains deprecated by the profession at large.

3. Urethrocystic membrane. — Applications to the urethra are made only for local purposes. Canthar in the solid form, as applied by the canthar tongue, is employed for removing permanent strictures, or irritability of the urethra.

Astringent and other injections, performed by a glass syringe,
are common modes of treating gonorrhoea and some other
affections of the urethra.

Injections into the bladder are highly serviceable in chronic
cystitis - they relieve the irritability of the organ, and at the same
time wash out and get rid of the decomposed foetid urine
and mucus. Injections of simple warm water are very
useful. Solution of pepsine or laudanum may be added in
some cases. Injections of very dilute nitric acid (through
a gold catheter) are said to be of great service when the
urine is highly ammoniacal. Dr. Hales was the first to
draw attention to the practicability of dissolving stones in
the bladder by injections through the urethra. Sir R. Brodie
has satisfactorily shown that phosphatic calculi may
sometimes be dissolved altogether, or so reduced in size that
they may escape through the urethra, by means of injections
of very dilute nitric acid. Dr. Hales was aware of the power
of carbamate or sub-carbmate of soda over certain kinds of
calculi. The efficacy of the water of Vichy depends in a
great measure, on the bicarbonate of soda which it holds in
solution. To succeed in such experiments much skill
and perseverance is demanded. In obstinate hemorhagy
from the kidney, injecting the bladder with cold water
containing a scruple of alum to each pint will often
put a stop to the alarming symptoms.
The operation in all these cases may be effectuated by attaching a catheter to an elastic bottle, or we may have recourse to the double catheter recommended by Mr. Ferguson.

From these considerations and the close connection which exists between these organs and the rest of the body, it will be evident that the general habit might be influenced by medicines applied to the genito-urinary surface. The urethra-vesical membrane—in the male more especially—from its anatomical conformation and relations, its susceptibility to induce local disease when irritated by foreign substances, and probably from its less absorbing power, would be found less eligible than the vagina-uterine membrane for such purposes, should this mode of medication ever come into vogue.
Some of the organs of external sense, especially those of taste and smell.

Physicists have at all times presumed on the activity and medical virtues of substances by ascertaining their taste and smell. When a strange substance is put into our hand and we are questioned regarding it, before an opinion is hazarded, we instinctively submit it to the perception of the organs of taste and smell. Physicists have been also ready to suppose a similarity of virtues is indicated by a similarity of taste and smell. And the supposition is borne out in many instances. Indeed some authors have endeavoured to found a classification of the materia medica on the indications afforded by these senses and that of sight. And one of the most successful of these arrangements is that of Mr. Greener. But this is carrying it too far, for there exists great fallacy in its universal application. In the first place there is considerable difficulty in ascertaining the difference of tastes in different substances. The psychological sensation if we may use the expression—of some tastes, as sweet and bitter, are generally agreed to among mankind; but there are just as many others with regard to a
particular taste of which, no great number of individuals
will give a common ascent. Such are the acids and
nauseants. Scent, which are of greater diversities, are
still more fallacious than tastes in predating or judging
of a similarity of medicinal quality. There is no good
general division of these except into agreeable and disagree-
able. Now it is well known to every one how very
opposite are the opinions entertained by different persons
regarding these so called sensations. In fact, we possess
very few words to designate the endless variety of tastes
and smells, of which we are even very sensible.

Sense of Taste. The nerves concerned in the production
of the sense of taste are proved by experiments to be the gloss-
opalatine, distributed to the posterior and posterior-lateral
parts of the tongue, soft palate, and its anterior arch,
and the lingual branch of the fifth supplying with its
special sensation the inferior surface of the anterior and
lateral parts of the tongue. The hypoglossal is purely motor.
The experiments of W. J. Reid prove that the glossopharyn-
geal is certainly not a special nerve of taste, although it
may be so in conjunction with others. It may be consid-
ered as a common sensitive and reflex motor nerve; first, as
a sensitive nerve of the fauces and tongue; second - a great
factor of pharyngeal movements necessary for deglutition.
The sense of taste is sufficiently acute after section of the nerve on both sides, as a dog was well able to taste a bitter substance—caucasium—though when given, it did not refuse it (notes from Dr. Bennett's lectures).

Medicines disagreeing to the taste and intensely bitter have been recommended in certain states of hypochondriasis and its sister condition, hypochondria. And may not a portion of the effect of nauseants, which have such powerful control over inflammatory and febrile diseases, be ascribed to the same modus operandi? Nausea, moreover, which has the secondary effects on the body may possibly and disagreeably divert the attention of a lunatic from extraneous objects and fix it upon himself, and vice versa: a delicacy to which he was formerly accustomed will find an espience, who in the most melancholy state of mind, into a better humour. Nausea will, in some cases, do more in these respects than any other course of treatment. The sense of taste deserves the every-day consideration of the physician in order to suit and render as agreeable as possible his preparations to the palate of his patient. The most nauseous medicines may be modified and coated over in such a manner as not to interfere with their efficacy, and thus find a more agreeable passage into the stomach, with less chance of being rejected.
Sense of smelling. In conformity with what was stated at page 69, the whole subject of application to the nasal membrane will be mentioned at this place.

The first pair of nerves give the sense of smelling, and from the fifth (branch of the first and second division) supply the Scheniderian membrane with sensibility. The olfactory nerve is spread out in an arborescent form and communicates freely with all parts of the surface of the mucous membrane of the nostrils, and back through the passages of the nare into the fauces, and thus by a slight transition the organs of taste and smell are united. The connection of the organ of smell with that of taste is manifested in most articles of food, which we smell and taste at the same time; and in general, too, when the smell is wanting the taste is imperfect. It has a similar connection with the organs of respiration, in smelling we always inhale air. It seems to have a particular relation to memory. Days retain through it the recollection of their masters. Odors often suddenly remind us of past moments. This sense is especially acute in the female sex, which may be occasioned by their tender nerves, the delicacy of their perception and their conventional education.

The material cause of odors is present in the air in the shape of minute particles of substances or these in a gaseous
state. They are brought into contact with the ramifications of the olfactory nerves, between which there are a number of glands like the sweat glands of the skin. The ducts of which are seen by means of maceration. In some animals in which the turbinate bones are large, the sense of smell is found increased. Smell is most perfect at the top of the nose, at which place there is a layer of epithelium in which branching the nerve ramify. The nerve filaments consist of gelatinous fibres, no tubules being in combination with them. Common sensibility of the nose we have said, is supplied by branches of the fifth pair. For the perception of smell, the internal surface of the nose must be moderately moist. This is facilitated by the convolutions of the turbinate bones, through which the air has to pass. As evidence of the perfection which this sense may reach in man, Mr. Wardrop mentions the case of James Mitchell, who, although both blind and deaf, recognised his friends by their smell. Instances of idiosyncracies also furnish us with many curious examples of unnatural conditions of its functional operation. Total loss of smell caused by destruction of the anterior lobes of the brain is rather common.

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* Many interesting cases of the kind, in the sense of tactile discrimination, are detailed in Lord and Bowmans Cyclopaedia of Anatomy and Physiology.
That class of medicines called Garumtes spend their force upon the first few principally, it might be said exclusively. Many fell into error in supposing that the Schneiderian membrane receives its peculiar sensory endowment from the branches (already mentioned) of the n. trigemini from the statement of Majendie, who was led to that belief from finding that the membrane of the lower animals still perceived, as usual irritating vapours and pungent odours after the first pair of nerves had been divided. But this can be explained from the great difficulty there is in distinguishing the sensation of smell from that of mere feeling and in ascertaining what belongs to each separately. This is the case particularly with the sensations excited in the nose by aroid vapours, as of ammonia, horse-radish, and mustard, etc., which resemble much the sensations of the nerves of touch; and the difficulty is greater when it is remembered that these aroid and pungent vapours have nearly the same action upon the conjunctiva of the eye and eye-lids. In Majendie's experiment, then, the common sensibility of the nose to these irritating substances had remained.

Medicines are applied to the Schneiderian membrane chiefly in affections of the nose or adjacent parts. Yet their action is not altogether local. Cullen says that apparently from the use of Garumtes he has known headache, pain of
The ear, and some cases of ophthalmia cured. Richter, in them at one time persons afflicted with diseases of the eye, resorted from all the countries of Europe, placed great confidence in certain kinds of medicated ointments. S. J. Thomson relates a case where a lady was affected with violent headache, accompanied with a sensation of what is termed stuffing of the head, and after having tried unsuccessfully different means to relieve the symptoms, snuff was prescribed which caused violent sneezing, and the expulsion of a plug of hardened mucus which gave her immediate relief.

Taylor quotes two cases where snuff adulterated with red lead caused death in one instance and alarming symptoms in the other.

It has been said that medicines intended to act on the inflammation membrane do not show much of a remote effect. But very many substances which were supposed to enter the system by pulmonary absorption, and some whose effects were ascribed to cutaneous absorption affect the system solely by impressions made on the nervous centres through the organ of smelling. Dr. Rowseann of Philadelphia made numerous experiments upon this subject; he states, that they warrant the conclusion that by simply closing the nostrils, either by compressing them with the fingers, or by filling them up, the fumes of ardent spirits, or of a
strong deception of tobacco, or an infusion of opium, may be inhaled in hours without any unpleasant effect, whereas if the preparation mentioned be omitted, the consequences are proven to be most distressing. On consideration it will not seem surprising, that volatile substances and those medicines which are known to operate by nervous contact, producing their effect on the first and the fifth pairs of nerves distributed over the pulmonary membrane, lining the nostrils, the adjoining sinuses, and the convoluted bones, so beautifully contrived to extend this surface in a limited space - it will not be surprising, we say, that these should affect the general system. The fumes of alcohol, tobacco, and amnmonic act thus. Chloroform and ether are undoubtedly absorbed into the pulmonary circulation, but may not a part of their effect be referable to the mode of operation we are at present considering? It is well known that many odors cause nausea, vomiting, and regurgitation as well. There are some also believe that the lungs constitute the avenue through which poisonous effluvia and anesthetic gases enter the system, reasoning from what has been said might not an hypothesis be as plausibly supported in assuring the phenomena to nervous communication or sympathizing through the organs of smelling?
When medicines are employed to irritate and excite a discharge from the nasal membrane, they are called Ershines proper; but when used to promote sneezing they are termed Stimulators or Stimulatory. Ershines are seldom resorted to in the present day in regular practice. They are more or less irritating, and their immediate powers depend on their increasing the natural vascular action of the part within a certain limit, and this occasioning derision from the surrounding or neighbouring parts; and we learn also that beyond that limit, instead of promoting a watery discharge, they tend to check it by causing inflammation. Stimulators are employed to promote the expulsion of foreign bodies lodged in the air passages, and to excite respiration when this function is suspended. The act of sneezing is produced by irritating the sensory extremities of the branches of the fifth pair of nerves distributed to the inflammatory membrane, which by the connection of that nerve with the eighth pair, the great sympathetic, and the phrenic nerves, calls into simultaneous action the diaphragm and the whole of the respiratory muscles so suddenly, after a full inspiration, as to expel the air from the lungs forcibly through the mouth and nostrils. Taken or given to excess stimulants are not without attendant evils. Their administration to the phlegmonous, or where there is a great determination...
of blood to the head, is always attended with danger. Many
instances are recorded in which aneurism has produced immediate
bleeding from the nose, epileptic fits, and apoplexy.

The other senses considered in relation to therapeutics,
depriving from the physico-mortal method of operation, assume
more of a psycho-physical, if the expression can be used—
that is, they have more reference to the thinking principle
until they end in pure thought.

Sense of sight. Those authors who have attempted to
found an arrangement of the Materia Medica on the
durable qualities of medicines as indicating their virtues, have
availed themselves of the impressions conveyed by this sense
as regards the colors of the different substances. W. quote
the following paragraph of Linnaeus:—color pallidus
encephalum, viridis erudium, luteus amarum, ruber acetum
albus dulcis, niger nigrae nigrae indicat. But it will be evident
to every one, that attempts to establish any such general
position is as unsatisfactory as it is useless. There can be
no doubt however, but that light, darkness, and colors
exercise decisive influence on the mind. Light acts as an
excitant, twilight as a calment; darkness according to
circumstances, acts as both: the positive colors, red,
yellow, etc. excite the mind; the negative, blue, etc. calm
it. The warm and cold coloring of painters, experiments with coloured glasses, etc., confirm this fact. Rovell and Esquiro affirm, from observation, that indigo dyers become melancholy; and those who dye scarlet choleric. Paracelsus recommended red coral as a remedy against melancholy, and declared blue to be injurious. Harmonious and brilliantly-coloured works of art have a cheerful effect on the mind, even independently of the subject which they may represent. There can be no doubt that the benefit derived by the melancholic or depressed mind in travelling, and contemplating the beauties of Nature is to be greatly ascribed to the same cause.

Sence of Hearing: Hearing becomes, in like manner, a channel through which the mind and from it the body may be excited by sounds. Beating a drum, firing a gun, ringing bells, and similar noises, have proved effective in fixing the attention, so as to ward off a lethargic sleep. A lunatic has been killed to sleep and cured by the noise of water dropping from the ceiling of his room into a copper vessel, another by an alarm of fire (Schechterleben). Music has been justly and often extolled as a physiological remedy, and was employed as such by the ancient world. Thus Galen cites Acenaphno for curing the disorders of the mind occasioned by a hot temperament of the body by this means.
So the Physicians by their music were said to cure all manner of Scoliotic pains; and Apollonius mentions it for epilepsy and distractions of the mind. Thales of Creta was thus said to cure the Sacerdemonians of their pestilence; and Democritus taught it as a cure for most disorders. Pythagoras is said to have used it in venomous bites and other disorders; and it was the cure for the bite of the Tarantula. (Kennedy) Music says Burton (Anatomy of Melancholy) is one and not the least powerful of those many means which philosophers and physicians have prescribed to helberate a sorrowful heart, and to divert those intense cases which accompany the complaint; it heal and revives the languishing soul; affects not only the heart, but the very arteries, awakens the dormant powers, raises the animal spirits, and renders the most dull, severe and sorrowful mind erect and arnible.

And this statement of the second Democritus is by no means

*Tycesa Tarantula: The tarantula is named from the city of Tarantum, in Italy, in the environs of which it is common, is very celebrated. In the opinion of the vulgar its venom occasions dangerous wounds, often followed by death, or by the disease termed tarantism (among the patient to shake and dance like one in a frenzy), which could only be cured by the aid of music and dancing. Judicious people think it more requisite to combat the terror of the imagination than the effects of the venom, for which the medical art supplies various remedies. (Cherier.)
we imagine, over-coloured.

The Sense of Touch, it is to remote from the mind to be made available therapeutically when it is required to act principally upon this.

We may however, say something here on the modus operandi of those substances which are supposed to act on the nerves, that is, the manner in which the impressions are made, explained as it has been attempted on mechanical principles. It does not seem to be impossible or even improbable that the operation of some medicinal agents, particularly those which act on the nerves, may depend in some way on the shapes of the atoms of these substances, as related to those of the atoms which they influence. At least there is no other possible explanation of the power of such substances. We know that the nerves are very much under the influence of mechanical impressions, upon which depend the phenomena of two at least, if the five senses, those of hearing and touch, as probably also of the other three, if we understand them better. We know also that if we accept the atomic theory, by which so many chemical phenomena are cleared up and explained, we must admit a certain definite and peculiar arrangement and shape to the ultimate particles of every compound body. These considerations render it possible that the ultimate particles of a stimulant medicine may be of such a nature as to irritate or
to refuse to coincide with the ultimate molecules of the sensitive nerve with which they come in contact, and those of the sensitive ray, on the other hand, be so shaped and arranged as to dovetail with those particles, and by extinguishing as it were their salient points, to cloak their vital sensibility. This is obviously a mere conjecture, and the only value which we can attach to it is, that it appears in some measure to explain a thing which without it, is inexplicable: (Headland.)
VI Of Serous Membranes.

The serous membranes form what are called the internal close cavities of the body, and investing in uninterrupted continuity the organs included within them.

This kind of texture is formed of fibro-cellular tissue interwoven so as to constitute a membrane, the free surface of which is covered with a tessellated epithelium. It is especially supplied with blood-vessels, lymphatics, and nerves. It is here for a most active absorbing surface; indeed, it is possessed of an activity of absorption which hardly any other unbroken texture can equal, and we have seen already that those medicines which act by absorption are more energetic when applied to the serous membranes than they are when taken into the stomach. So advantage, however, is taken of this surface, with one or two exceptions, for the direct application of medicinal agents. The inflammation, leading to fatal results, which is liable to be excited is of itself a sufficient impediment to any such practice. Still in the Philosophical Transactions for 1744 there are a few cases related of the successful performance of the hazardous operation on some of the larger serous cavities. One of the exceptional cases in which recourse is had to this
mode of medication is, in what is termed the radical treatment of hydrocele; and consists in puncturing the sac of the tunica vaginalis, allowing the contained serum to escape and then injecting certain stimulating or irritating fluids in order to excite a degree of inflammation, sufficient to destroy its secreting faculty and lead to complete or partial adhesion of the sides of the sac. Equal parts of spirit, wine and water, or gin, lotion, are commonly used. Lime water is advocated by others: but the remedy most in favour at present is the kavitate or solution of iodine.

The other example, we refer to, is in what may be also called the radical cure for bursitis, loose bodies in thecal or bursal cavities, and some rare forms of enucleated tumours. When having failed by the usual means employed to cure these, we then treat them as for hydrocele, drawing off the fluid by a trochar and injecting a small quantity of the solution of iodine.

Cases are related of injections having been made into the peritoneal sac inrophey of that cavity and with successful results. But it must always be a perilous and un-...

Mr. Christie and Boddet found that four ounces of a solution of oxalic acid injected into the peritoneal sac of a cat, killed the animal in fourteen
minutes. On opening the animal although none of the fluid had escaped by the wound, they found scarcely a drachm remaining. When acetic acid is introduced under the same collateral circumstances into the stomach of one dog and the peritoneum of another, the dose may be so apportioned, that the same quantity which does not prove fatal to the former, kills the latter in fourteen minutes (Edin. Med. & Surg. Jour. XIX. 130). The same poison is said to act with eight or ten times more activity when injected into the peritoneum than when swallowed.
VII. The Surfaces of Wounds, Ulcers, and Abscesses.

In medical practice applications to the surface of recent wounds, ulcers, and abscesses, are usually employed to produce specific therapeutic effects, but in some rare instances they have been made with the more extended view of influencing the general system. Thus, it has been proposed to rub corrosive sublimate or fine powder into incisions made for the purpose, then it is wished to cause sudden evacuation and to bring the system quickly under the influence of the medicine. But we will also see that in some cases where medicines are applied for exciting a direct local action they have produced constitutional effects. Active medicines and poisons, when introduced into a fresh wound, are well known to operate with an activity and facility little less than when injected into a vein, and there is no difficulty in explaining the operation; the substances dissolved and diffused through the blood come into immediate relation with the divided mouths of the capillaries, veins, and lymphatics, and pass at once into the circulation. They are also necessarily brought into contact with the extremities of nerves, and may readily select this channel.
of transmission. We are informed that poisons do not act at all on the cut surface of nerves; allowing this to be correct, there will still be a multitude of nervous terminations intact.

Examples of these may be adduced in the alarming consequences of poisoned wounds inflicted by animals or poisonous substances. The arrows of the South American Indian, which have been left in the wouned person, will kill a large well-fed ox, even when struck in a non-vital part as above the hock, in twenty-five minutes. A wound inflicted on the breast of thirteen commoners of the Emperor of China, who had been convicted of infidelity, by means of a large lanceet poisoned with the gum of the ufas, produced death to the four criminals in sixteen minutes. (T. Chardin)

The poisoned wound produced by the bite of certain serpents sometimes causes death. And we never and again meet with serious and even fatal effects consequent on the inoculation, or application to a wounded surface, of morbid animal poisons, as the saliva of raged animals, the matter of venereal or gangrenous ulcers, and of dead bodies.

Moreover, of contagious:—during epidemics of erysipelas physicians are so well aware of the mode by which the disease frequently propagates itself in a general community as an hospital, as to take the proper precautions to arrest its diffusion. The infection of hospital gangrene and
encephalitis is generally attributed to reanimated, or the modern product of effluvia of the already excited disease, being absorbed through each broken surface of the body as ulcer stumps, so that they are noticed to collect for their invasion patients who are so exposed. In maternity hospitals, fever, peripheral fever and encephalitis may often be found co-existent, and there is little difficulty in tracing the infection of the one to the other. In the human subject the poison of fasciitis has in general been latent from two to eight days, or, at least, the patient has in general, continued well during that period after the accident of the application of the matter to a core or to a puncture. The poison of cellulitis venerate from the data of observation and experiment is absorbed by the cutaneous, the cellular, and the venous tissues. The persons who have fallen victims to this poison have been those who have received wounds, either in discharge or else in the prosecution of their business, as medical men and students, butchers, farmers, cooks, etc.

Pauls observed that six grains of morphin dissolved in a drachm of glycerin and injected into the cellular web of the thigh of a young dog caused so much commotion and insensibility that the animal seemed as if dead; although after forty-eight hours it revived. If twelve grains were given, vertigo succeeded after three minutes, and all the
other narcotic symptoms of opium; after six hours delirious
commonness, and paralyses of the posterior limbs; the
symptoms diminished on the next day, and in five days it
was quite well. He further testifies that Dr. Belladon
having been applied to a wound on the inner part of the thigh
of a dog diluted the pupil very much in twelve minutes,
and the animal died on the following day. Two draughts
of Digitalis applied to a wound on the back of another
dog produced vomiting in twenty minutes, then dilatation
of the pupil, copious liquid evacuations, and vertigo, so that
the animal could not stand: it died soon after.
The juice of Aconite applied to a small wound on the
finger produced pain in the finger and arm, cardialgia,
anxiety, lipothymia, agitation, gangrene, and profuse
suppuration of the member. Arsenious acid placed on a
wound produces, it is said, inflammation of the bowel
darker than if it had been taken into the stomach.
A surgeon who had extirpated a sarcomous tumour from
the mamma of a young woman of eighteen, applied an
arsenical plaster to obviate the occurrence of ulceration;
on the following day the girl suffered severe colic and
vomiting: she sank after two days. The post-
mortem examination showed the intestines inflamed
and stained with black spots. (Hoek.)
Clean healthy ulcers, sores, and excoriations are less vigorous as absorbing surfaces than that of wounds, but they are not so inactive but that energetic substances may, as they sometimes do, act constitutionally through them, and that with symptoms of considerable violence.oul ulcers, suppurating sores, and abscesses absorb still less, obviously because the pus or other discharge defends their surface and prevents the more immediate contact of the substances.

Remedies are applied to these surfaces, we believe, exclusively for topical effects, but it should be remembered that mercurial salivation accompanied at times with well-marked inflammation of the alimentary canal, has been produced by the application of the ointment of the metal. Dr. Christian relates some fatal cases so produced. From arsenious acid, which is often used topically in ulcers and unmanageable ulcerations, fatal accidents have in consequence not infrequently resulted. Colica pectoris has been unequivocally traced to the application of Coulard's extract and other preparations of lead to open ulcers.
The internal surface of the Vascular System.

There is no way in which poisons, that act through the blood, prove more rapidly fatal than when introduced directly by a wound in a vein; — and there is likewise no quicker method of producing the peculiar effect of medicines. Thus it is found that mixomias occasions tetanic spasm, opium coma, that tincture emetic produces vomiting, that arsenic and saline solutions purge, and so on. And they, but especially those which operate directly or serve as narcotics and emetics and which do not require to be digested in order to act, produce effects very similar to, though more powerful than, those when these agents are exhibited by the stomach. To this statement, however, there is an exception in the case of the oils, and substances possessing the power of conglutinating the albumen of the blood. They occasion, it is true, a kind of asphyxia, but which is to be attributed to the interrupted circulation and not to any physiological peculiar action of the substances themselves. On the other hand there are many articles which, when injected, or applied to any mucous surface, are quite inert or very feeble in their action, probably from being decomposed or changed into inactive compounds in the course of the longer absorption, but produce the most
decided effects when thrown into the veins. The noted case of
the animal poison will suffice to illustrate this fact. Certain
poisonous poisons, too, may be very speedily communicated in
this way. Professor Coleman produced the disease (the glands)
in the ass by transposing from a glandered horse. The glands
in the ass was rapid in its progress and violent in its degree,
and from this animal he afterwards produced both fever
and glanders. (R. Williams) — Some poisons when injected
into a vein operate with an electric-like velocity almost
incredible; — hydrocyanic acid for instance. Ten drops of
cyania (saturated with hydrocyanic acid) injected into
the femoral vein of a dog began to show symptoms of the
action of the poison in fifteen seconds; in fifteen more the
animal was quite dead. In a similar experiment with
eight grains of oxalic acid, P. Christison found that
death was produced in thirty seconds after the injection.

Next, we may turn our attention to the question
— how do medicines or poisons act when introduced into
a vein? There are, we think, only two plausible
propositions which have been adduced to explain the matter.
The one is that the substance pervades the whole organi-
ization through the medium of the circulating blood, but
only affects such organs as possess a peculiar suscepti-
bility of its action. The other supposes that the expansion
of nervous filaments on the inner surfaces of the congenerous vessels received the medical or poisonous impression, and conveys the influence to remote organs.

This question, in fact, involves and forms a part of the more general one with regard to the modus operandi of medicines. We do not mean, however, to venture to any great lengths on the consideration of this much contested, complex, but most interesting subject.

One class of physicians, including in its ranks names of the highest consideration, maintain that the operation of medicines is solely dependent on absorption of the particles of the substance into the circulation. They rest their opinion on being proved by the following facts: 1. The disappearance of the medicine or poison from the part to which it was applied; 2. Its detection in a remote part, as in the blood and bile, in the animal solids, in the excretions; 3. The prevention of its remote effects by the prevention of its circulation; 4. The promotion or relaxation of its remote effects by the promotion or relaxation of its circulation; 5. The similarity of remote and local effects; 6. The medicinal or poisonous quality communicated to the animal solids and fluids; 7. The occurrence of remote effects after the division of the spinal cord, or of any part except the blood vessels; 8. The production of the remote effects by injection of a medicine.
or poison into the blood." (Persian Med. Med. Page 95)

Another class of physiologists, again, equally distinguished and scarcely less numerically imposing, content with just as much confidence that remedial agents affect remote parts through the agency of the nervous system by an indiscernible influence, the true nature of which is unknown. They say that the instantaneous action of some poisons, and the sympathetic conveyance of a local impression, purely functional in its nature, to parts at a short distance from the tissue acted on directly, cannot be explained by any other likely mode of operation. Medicines and poisons, properly so called, were formerly supposed to act, not by absorption but through the agency of the nervous system. In the present state of our knowledge, however, this notion is quite untenable. For while the evidence adduced in favour of the opinion that medicines operate in consequence of absorption almost amounts to absolute demonstration, the arguments in favour of the sympathetic action of these agents are few, feeble, and of doubtful validity. Still, on the whole, says T. Labrèche, the velocity of the circulation on the one hand, and the rapidity of the action of certain poisons on the other, are both of them so very great, and the comparative observation of the time occupied by the two phenomena respectively, becomes in consequence so difficult and
precarious, that it seems unsafe to found upon such an inquiry a confident deduction on either side of so important a physiological question as the existence or non-existence of an action of poisons by sympathy.

Between these two contradictory opinions many modifications have been advanced; the most perfect and obvious among these is that proposed by Dr. Morgan and Addison. They conceive that the medicinal substance is first absorbed into the venous capillaries, and that then it produces its peculiar impressions on the expansion of nervous filaments, mentioned before, from which these impressions are communicated along the nerves to the brain or other organs. They further consider that the sympathetic action of some poisons is unequivocally established, but they seem to lean to the opinion that the nervous expansion of the inner membrane of the bloodvessels is more peculiarly fitted than the cerebral extremities of the nerves elsewhere, for receiving the impressions made by poisonous agents;—nay, perhaps, that it is the only nervous expansion which possesses that function, except in regard to poisons which cause evident organic injury, such as inflammation or corrosion. He will conclude what we have to say on this subject in the words of Dr. Parke. I think he says he (Page 155 of Pharmacæ), it will appear that
medicinal bodies may occasionally act by absorption, as well as by nervous transmission. Without such a concession, we will not only be unable to offer any probable theory of the operation of certain remedies, but we shall be compelled to array

- *Examples like the following have generally been ascribed to reflex nervous action. Swallowing a piece of ice will sometimes produce pain over the bow; and it is likely that the headache which follows over-eating, or a large dose of a tonic medicine, may result in a similar way, from mere irritation of the stomach. Any irritant, as a solution of iron, arsenic, or zinc, will do the same. The action of a violent purgative will cause headache while it lasts. The irritation of the mucous membrane of the stomach, and probably of the filaments of the vagus nerve distributed in it, which precedes the act of vomiting, may cause the contraction of the muscles of the abdomen. The propagation of contraction from one muscular organ to another appears to take place in the case of violent purgatives, particularly some as Aloes and Senna, which act on the lower portion of the large intestine exciting it to a peristaltic contraction, whose action may thus be extended to the contiguous intestines in the female, causing it to contract. They may thus cause the appearance of the menstrual secretions when deficient or retained.*

To these we may add as capable of the same explanation: - the pain which occurs in the knee in disease of the hip joint; in the left arm, in some cases of heart disease; in the right shoulder, in disorders of the liver; irritation in the mammas from disease of the uterine irritations at the surface.
The facts of our experience in contradiction to each other; thus, if
we exclusively adopt the theory of absorption, the rapid action of
hydrocyanic acid opposed itself; if, on the other hand, we maintain
the conducting powers of the nerves to the exclusion of all other
agency, how comes it to pass that salicylic acid is rendered more
active by dilution? If a mechanical injury of an extreme
nerve can convulse the whole system, as we observe in tetanus,
why may not an impression by a medicinal agent be pro-
pagated through the same medium.

We turn now to the more practical part of the subject
that heads this division - the injection of medicines into the veins.
The first experiments of this kind were in the shape of

of the urethra from alone in the bladder, foreign matter lodged in
the kidney acts in the same way; and ascariids of the rectum produce
abnormal sensation both there and at the other extremity of the urinary
canal. Again an irritating agent applied to one part of the body may
induce an irritation in another and distant part, with which
it has no apparent connexion, either by sympathy of function or
by continuity of nervous or other tissue. Local accumulations on the
funicular, for example, may occasion irritation in the face or
in the heel; each perverted sensation leading on effectual
discharge of the noxiousfeculent matter (Prof. Miles).
"In a large cauldron now the medicine boils,
Compounded of her late collected roots;
Bleeding into the mesh the various pow'r
Of wonder-working juices, roots, and flowers;

When this medicine op'd
She cut her patient's throat; the exhausted blood
Recurrent with her new-enchanted fluid;
While at his mouth and thro' his opening wound
A double net her infusior found;
His feeble frame assumes a youthful air,
A glossy brown his hoary beard and hair,
The meagre paleness from his aspect fled,
And in its room sprang up a florid red;
Thus all his limbs a youthful vigour flies,
His emaciated veins swell with fresh supplies."

* Translation of the passage on the opposite page.
what is termed transfusion or the transmission of blood from one living animal to another. Some physicians contend that the operation of transfusing medicated fluids and blood itself into the system, is of very remote date; and they ground their supposition on some passages in the ancient poets. Thus Ovid represents Medea as renewing the youth of Jason by injecting the juice of herbs into his veins:

Quod simul a vidit, strenue Medea recludit

Since canes jungulum, veterumque laxe erubescens

Prae, repit neuris, Ludos postquam Combinit Asson,

Ant ore acceptas, aut vulnera, barba, comaque

Canicie positum, nigrius rapinus calorem.

Pulsa fugit macies: abundit galloque atque austerus;

Adjectaque cavae suppletur canumque vense,

Membrana luxuriant.

Metam. lib. III. 285.

There is no reason to regard this otherwise than as one of those adventurous flights of fancy, which poets are licensed to indulge in. It has been supposed that in these early times blood was actually transmitted from one person to another, and a second passage in the same fascinating author, where he described Medea's fiend-like deception practiced upon the unsuspecting daughters of Pelias, has been quoted in proof.
That these will not bear any such interpretation must be immediately evident; the expression relied upon is nothing more than a poetic method of describing her intention generally of restoring him to youth: as, indeed, the whole context, and the pretended canonical preparations she makes, abundantly testify.

The first experiments on transfusion are said to have been made in Germany. Sir Lucas O. Bedford and Edmund King were the originators of the practice in this century; and

Meanwhile the king, with all his guards, lay bound
In mace sleep, scarce that of death so sound;
The daughter now are by the corridors led
Into his chamber, and surround his bed.

Your fathers health's concern'd, and can ye stay?
Unnatural nymphs, why this unhind delay?
Unsheath your swords, dismiss his lifeless blood,
And I'll requite it with a vital flood.

The whole subject is fully treated of in the first four volumes of the Philosophical Transactions.
Their first experiments were undertaken in the year 1660. They were
soon followed by Denys of Paris. Dr. Christopher Wren,
Savilian professor at Oxford, transfused Opium and other
medicaments infusions into the veins of dogs previously to the
year 1665. Fabricius introduced purgative medicines into the
median vein of a man and two women in the hospital of
Bantzia; the man was affected with secondary syphilis; the
women with syphilis; one of the women died; the other
two patients appeared to be benefited.

Harney was thirty years before he could get his discovery
admitted, but as soon as the circulation was acknowledged,
people's minds were seized with a sort of delirium: it was
thought that the means of curing all diseases was found,
and even of rendering man immortal. The cause of all our
evils was attributed to the blood: in order to cure them
nothing more was necessary but to remove the bad blood, and
to replace it by pure blood, drawn from a second animal.
The first attempts were made upon animals with complete
success. A dog having lost a great part of its blood,
received by transfusion, that of a sheep, and became well.
Another dog, old and deaf, regained by this means the use
of hearing, and seemed to recover its youth. A horse of
twenty-six, having received in his veins the blood of four
lamsbs, recovered his strength. Transfusion was soon
attempted upon man. Ternyi and Steiner, the one a
physician, the other a surgeon of Paris, were the first who
ventured to try it. They introduced into the veins of a young
man, an idiot, the blood of a calf, in greater quantity
than that which had been drawn from them, and he appeared
to recover his reason. A leprous person and a quaranum ague
were also cured by this means; and several other transfusions
were made upon healthy persons without any disagreeable
result. However, some sad events happened to calm the
general enthusiasm caused by these repeated successes. The
young idiot we mentioned — also, by the bye, had a second
time been subjected to the experiment without injury — fell
into a state of madness again. He was submitted a third
time to the transfusion, but while the operation was being
performed, he was seized with a hematuria, and died in
a state of sleepiness and delirium. A young Prince of the
blood was also a victim to it. The Parliament of Paris
prohibited transfusion. A short time after, C. Riva
having in Italy performed the transfusion upon two
individuals, who died of it, the Pope prohibited it also.
From that time, the operation gradually fell into disuse,
and we hear little of transfusion of blood until its late
revival. Of late years transfusion has been sometimes
successfully employed in cases of great loss of blood,
as from flooding, and where patients were sinking from the first effects of violent injuries; and the injection of stimulating fluids into the veins has also been used in similar cases, and in debilitated diseases.

We now and then avail ourselves of the operation as a last resource in some highly dangerous and obstinate diseases, as for instance in hydrophobia, in cases of poisoning, and in Asiatic Cholera. Majendie proposed the injection of tepid water into the veins in hydrophobia; but in all the cases in which the experiment has been tried, although it seems to give a temporary relief to the symptoms, it has not proved equal to cut short that dreadful disease. In malignant cholera injections of various kinds have been recommended. In this disease the blood assumes a tar-like appearance, and the circulation becomes sluggish, and more or less stagnant in the capillaries. Some practitioners have, with the view of obviating this state, of liquifying and reddening the blood, and restoring the functions of the circulation, proceeded to introduce into the veins warm water or various saline solutions. And the practice has seemed sometimes to be attended with success. More frequently, however, the effect upon the condition of the patient though marked and immediate was only of a temporary kind. Yet in many cases this temporary amendment might be of
great importance. Another set of practitioners, supposing the changed quality of the concomitant fluid to be owing to the deficiency of the saline constituent of the blood, propose to rectify that by saline injections. Chloride of sodium, the salt generally selected, is reported to restore almost immediately the pulse, which was before imperceptible, and in some cases to bring about reaction and recovery. Saline's solution which has also been tried, is advanced, we suppose, under some such idea as neutralizing by its disinfecting quality the offending or contagious matter of the disease. Dr. McGregor, who was one of the physicians to the Glasgow Royal Infirmary at the time of the last epidemic visitation (1848-9) spoke very encouragingly of the injection of a solution of murate of morphia. So checked, he said, the vomiting, purging, and cramps in most cases, and the patients declared themselves relieved; some slept, and others said they felt as if they were becoming intoxicated. His solution was prepared by dissolving five grms. of the crystallized murate of morphia in an ounce of pure hot water; thirty drops of this solution was then mixed with six ounces of pure water, at a blood-heat temperature, and injected with certain precautions into the vein above the bend of the arm.

The important fact, first declared, we believe, by
For Paris, and shortly afterwards more distinctly proved by the experiments of Majendie - that the energy of absorption is generally in an inverse ratio to that of the circulation - is taken advantage of in cases of poisoning. So that in cases of narcotic or similar poisoning by throwing tepid water into the vein, and causing a vascular congestion or plethora, we will alike increase the power of absorption, and the poisonous symptoms which under ordinary circumstances would have manifested themselves. And in this way a patient so poisoned may be sustained, until the subtle influence of the poison having gone off, he may ultimately recover. But in the case of the other fixed poisons (if we may so call them), Majendie found that although their action was superseded, as long as this unnatural fulness of the bloodvessels could be maintained, yet no sooner did the plethora cease than the poison acted in its usual time, and with its customary severity. That physiologist has also shown, if a poison be introduced into the system of such potency as usually to destroy life in two minutes, on

* Plethora and fever counteract absorption by causing pressure on the coats of the intestinal capillaries. Bleeding or such agents as Tartar Emetic and Ipecacuanha diminish the pressure by weakening the force of the heart, and thus favour natural absorption (Headland).
bleeding the animal the same result will follow in half a minute, or in one-fourth of the time. Two rabbits were persuaded by strychnine in St. Thomas's Hospital, one wasbled and the other not bleed; the former died in twenty minutes, while the latter survived for forty-five minutes.

It is even asserted by Berrère that the development of contagious diseases may be prevented by the early use of aqueous injections. Cold water has been injected into the umbilical vein in cases of retained placenta. There are certain other cases, moreover, the urgency of which can alone render excusable the employment of this highly dangerous operation, as in obstruction of theullet from impacted food; for instance in such a case as that quoted by Dr. Pereira, where Kohler preserved the life of a soldier, in whose throat a piece of beef tendon was sticking, by throwing a solution of six grains of emetic tartar into a vein of the arm: vomiting was induced, and the meat expelled. Meckel injected two grains of this salt, dissociated in water, into the vein of a woman, to restore suspended animation from immersion in water.

The objections to this mode of employing medicines are in the first place, the great danger of the process, as inflammation of the vein from the violence done to it—the admission of injection of air while performing the
operation — an over-repletion and distention of the vessel by
the liquid — any of which may occasion the death of the
patient. Then, in the next place, the uncertainty of the results,
or, rather, their over-uncertainty, we cannot regulate the dose
of the medicine to any desired resulting standard; in many
cases the effects are of the same general nature as when the
medicines are applied to other surfaces, and then, therefore,
not precluded from making applications to these, we should
not prefer a pernicious operation to others comparatively
harmless. Notwithstanding these objections, however, it
may be resorted to in such rare and desperate cases as
have been mentioned; and also when the patient cannot or
will not swallow, or the alimentary canal is either very
irritable or insensible to the action of medicines, and
when a rapid action on the system being required, the
other processes would be too tardy in producing the
results. To these might be added, other minor consid-
erations, as: — when the substance is expensive, or can
act in very small quantities; when it is desirable to
avoid any local excitement of the surfaces employed
in the other modes of medication; and when as in
the case of a new remedy the physician wishes to
ascertain and study its action, uncomplicated and
unobserved by those sources of fallacy which so frequently attend the internal and other modes of exhibitions.

FINIS.
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in the composition of the Essay.

Inter cuncta leges et percontabere doctores.
Hor. Epist. I. 18.

Avis indigesta e floribus melia coligit, haende in
viscerum cellulam concusta maturat, ipsisdem tamen
incudat, donec ad integram perfectionem perseveret.

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