

194 says he "produces a *Contraction*". But what is stimulated? it is not known a priori what it is. I could in like manner observe in the *Act. XXIV.* of Gualtierius that he plainly implied the word *irritation*, which is accordingly too limited for a general term. But it will lead you to observe from the use he makes of it there he means *impression* more generally. I go on now to fix more precisely the meaning of the term *impression* as we employ it. It may be taken for any impulse of external Bodies on Animals. We mean the action of other Bodies upon the nervous parts of our own, and affecting the motions of the System, An instrument making a Wound does not belong to our Head of *impression*. You know many parts of the Body may be wounded without affecting it. Nor is a liquor which is thrown into the Blood vessels and coagulates the Blood, to be considered as such, and it must have many effects. Mr. David Hume employs *Impression* in opposition to *Idea*. *Idea*, says he, is that modification of thought which by various means may be renewed in the mind, without the presence of the external object which at first occasioned it. We not only consider the modification of thought but the motion in the nervous

System. And if it shall be shown that Bodies can act upon our nerves, and excite motions without an *Idea* excited we also call these impressions. Under this Head of *impression* I also consider all these modifications that often successively arise in consequence of impressions, viz: if they are the beginning of new affections of motions of the system. To one man the same thing will be painful that to another will be pleasant; and even to the same man at different times. This pain or pleasure I call a new modification of the sensation or *Idea* received; and if it proves a beginning of new motions or new affections of motion I call it *impression*. In me, a thing having relation to my good or evil will be a cause of hope or fear, and therefore will be a beginning of a new modification of motion. On this subject I have very frequently taken hints from Gualtierius, and have him in my view; you may compare his *Traicté de morbis solidi vivi* with what I have said. It is proper to observe that in every perception of ours there are several particulars to be considered. Haller in *P. DE VII.* takes notice of them, to which you may attend to settle the limits between perception and impression.

196 We place first the external Body perceived;
secondly the impulse or motion excited in the
organ of sense; thirdly the motion then com-
municated to the Brain; fourthly the mo-
dification of thought thence arising; fifthly
the consciousness of the perception received.
Others, as Dr. Porterfield, have made some dif-
ference in the arrangement. In colour, which
he treats of you may consider as a property in
the rays of light or of different Degrees of trans-
parency; and secondly as a property in the Body fit-
ted to receive one ray more than another, and thirdly
the communication of it to the sensorium commune;
fourthly the Idea in our mind, and fifthly the
referring colour to the external object. The two
first of Haller plainly belong to impression, and
the Idea of the mind to perception. It is only the
motion communicated to the sensorium that is
ambiguous. Does Porterfield refer it to impressi-
on as I do, and yet as it is in the confines of both
it may belong to perception. I am next to speak
of external Bodies as causes of impression, and
what it is that they excite in the nerves.
The Causes of Impression may be two; cor-
poral or mental; the Corporal are the action of
matter upon matter. Whenever we can observe or

infer the impression to depend on matter, 197
such an impression we call corporal. The
mental again are all those modifications of thought
that are the beginnings of new motions and may
be considered as impressions. This division would
seem to be the same with Whiston in the fourth
Page and seventh Paragraph, of his narrow Dis-
orders. I do not mean that mine should correspond
to his, it being very faulty as I will shew afterwards.
Corporal impressions must be divided into exter-
nal and internal; the external are the actions of
Bodies evidently situated without us and which act
upon the substance of our Bodies; and these are
evidently external impressions. But there are
other impressions not so evidently such, which
must also be arranged under this head; such as
food or medicine operating upon the internal
parts. But it is the same thing, whether they
act upon the surface of the stomach or the intestine
or act upon the skin. Nay extraneous Bodies, as
worms even produced in the Body are exerted
from our Bodies and likewise to be considered
as extraneous or external impressions. Liquors
exerted from our Bodies and acting internally
upon it, such as the Biliary juice may be con-
sidered as such. — Internal impressions are
the actions of the Body in a sound or diseased
state, and an ambiguity may arise here; if this

198 be compared with the last, whether the ideas
of the stomach or food introduced is the cause
of the perception. In this way you may concei-
ve of external corporeal impressions. What I
have to say next will apply to the internal, but
as we can not always be certain of giving clear
Ideas in this way, external corporeal impressi-
ons may be divided into Mechanical and Che-
mical. Mechanical impressions depend on the
general properties of Bodies, as pressure, size,
and figure. As to the Chemical I must own
that they can not be supposed to exclude mo-
tion and its effects and therefore may agree with
the mechanical. But when the motions and its
various modifications are not to us evident, I
would call them Chemical; As those of the me-
chanical are always attended with evident mo-
tion. But there are actions of inanimate Bodies
upon each other, in which we can make the same
distinction. This is the foundation of the dis-
tinction between the objects of chemical and me-
chanical Philosophy; And in other words chemi-
cal impressions are those, which are made by
the Bodies that are objects of Chemistry. Haller
has charged the title of chemical into venena which is
wrong. Whatever shall be said of the propriety of

199
this distinction it is useful; it obviates various
frivolous Theories which we have fallen into
on this subject.

Lect. XXXVII. January 8th.
It is possible that chemical and mechanical
impressions may be of one and the same nature.
I must say that I am of opinion the whole op-
erations of impression are mechanical at bot-
tom. If all our sensations do arise from motion
either increased or diminished in the extremity
of the Nerve, and thence propagated to the sen-
sum commune we can not conceive any thing but
mechanical impression. It must be all impulse
or momentum, or again resistance or inertia. If there
be any other ^{modification}, the chemical must act in the same
manner. The soul and Body do act upon one a-
nother, but nobody in their wits pretends to say
how this action is performed. There is another
use of this reasoning, to obviate false theories,
we are apt to be limited in our notions of me-
chanism, we are apt to conclude that there is
a pointed Body in every stimulus, or such like
modification of figure, if we see it in one instance.
And we refer the operation of all stimulants to
this. The corpuscularian and epicurian Philoso-
phers of old produced much theory which was

200 furious from too limited views. Gaspardi, Des
Chastes, and M^r. Boyle, will furnish specimens
of this. Look into the corpuscularian chemi-
cal theory of Homberg and Lemery and you
will see what nonsense is there; and too much
of this is even to be found in the great Doct^r.
Boerhaave. I will show you how D^r. Gaubius
in the *acritates morbosae humorum* Paragra-
ph. 299 and following ones treats this subject;
His Idea of acrimony is not from a notion of
figure, but from its proving a stimulus to a
nimal Bodies, and drawn from analogy. "Ac-
in genere &c". This definition may be vari-
ed in this manner by leaving out what we
learn only by inference afterwards. I say all
that we can say is that acrimony has the power
of stimulus, and the pungendo &c. of Gaubius is
to be rejected as only to be learned afterwards by
inference. In P. 292, he explains this: "*Acritas*
mechanicae vis &c.

"incurrant". He speaks of
sharp pointed Bodies that by acting upon a small
portion they render it more penetrable. He ex-
plains next what chemical is: But we shall
presently show that this is a very false naming

Gaubius is diffident of it himself & says me 201
an ready to push such an analogy; but let that
analogy be pushed no further than experience
shall shew it to take place in fact. He finds
it difficult to discover pointed Bodies in figures,
and has recourse variety of them. I will not
say that the actual figures are not required. It is
certain that stimuli on our Bodies may be very
different. from mechanical act. And fur-
ther

That is to
say as mechanical require to be put in
motion I imagine this means
no more than that D^r. Gaubius saw that the
something different mechanical from
mechanical put in motion, tho he could not
evolve his own Idea. Let me attempt to shew
that this notion of figure has been pushed too
far. When a piece of thick glass is heated if there
are any inequalities in it the glass flies in
pieces; but this is very different from the action of
a Wedge. Vibration can be excited in the air that
will make a glass fly in pieces, but no body ever
thought of reducing that to the operation of mecha-
nics. I believe nobody doubts that magnetism and
Electricity depends upon a subtle Elastic fluid;
but no body has called that mechanical. If the at-

202 traction of cohesion depends Depends upon either,
we see a subtle elastic Power whose impulse
may be variously modified. From all these we
will see a variety of operations that at the bot-
tom must be allowed to be mechanical, but ver-
ry different from any that we know to be such.
I shall leave you to doubt whether the magnetic
and electrical Powers (tho they are particular)
are chemical, I say the Phenomena depending
on attraction of cohesion that are chemical &
those of Heat. I shall put one illustration; If
it shall be found from our observations, that
what ever tends to separate the particles com-
posing our Nervous fibres proves a stimulus
to them we readily perceive that chemical
solvents do in a different manner from knives
or wedges. Gaubius when he explains the diffi-
rent manners of its operation; "quæ & quid".
Boerhaave gives an Idea of a thing gnawed with
teeth. I will carry it still farther and consi-
der it more minutely. First with regard to the
more obviously mechanical, which depends up-
on the motion of large masses, these act by
pressure or impulse of Bodies in motion, applied
either to the middle portion while the extremi-
ties are fixed and tend to bend it or to one end or

both while the other is fixed to extend it; and thus 203
is one other; viz; the action of sharp pointed Bodies.
It comes to be varied as they are single or simulta-
neous ones they are modified in an order of
succession. Moral Philosophers wanted to unite
this in one View as it all had a tendency to de-
stroy our nervous humour. But how perfuse
will do this is difficult to say. In deed the ac-
tion of pointed Bodies might do so, but it is to be
doubted if its operation is to be referred to this
kind. We have many instances of the action be-
ing exerted at a greater distance, our fibres can
be set at a great degree of distance without pain.
There may be another theory than that of separat-
ing the particles of our fibres. The single effect
of points in electrical Phenomena, in passing
from Body to Body, and several Phenomena
in Chemistry, lead us to suspect that a very
subtle division of Bodies gives them new &
singular qualities; If so be our electric system
may be very different from what we ima-
gine. Let us not be rash; there may be modifica-
tions of the actions of Bodies that we have not
dreamed of. In Par: 229 Gaubius is wrong in
assuming the term acid for Stimulus, while
he takes no notice of the other stimuli, which

20th may be call'd equally acrid. Strong light and strong sound may be acrid but they are not to be reduced to the mechanical acrid. Even taste & odour may be mechanical stimuli but not sharp pointed Bodies. What he says in Lat; **DECLXXII.** is extremely proper, and the precision that is in it may escape you, "ut afflatus est." *Volenta &c*" That is to say he still recurs to his old explanation, but it is "quae cohesione", he is ready to admit of some thing else.

I am to proceed now to speak of chemical impressions that are chiefly obliged from their unknown nature to take them from the various objects of Chemistry; they shew a different relation to animal Bodies, by affording different organs of it, or different parts of the same organ. — **Lect. XXXVIII.** Jan^y 9th.

D^r Gaubius 233 Par: *"hungendo &c* has indeed given the language of pathologists; he gives it as a comendat a fault in almost every word. If you take care for *quaequid valit* stimulate you may but to say that it operates *hungendo* is false, there being many that operate in a very different manner. And if he should say he did not mean to comprehend every manner of operating, I say there

is little use in separating these from the last; 205 for the modes of operation are not even all the mechanical ones. Acrid is whatever stimulates and mild does not. But he has erred in meaning chemical and mechanical modes of operation, and his conclusion is false. — The mechanical are such that in sensible maps they move the more considerable parts of our Bodies. Those that act upon small portions of our Bodies are not chemical, but mechanical. And further when the qualities depend upon attraction of cohesion, I call them chemical impressions. Nothing is more foolishly presumptuous than to think we can make any thing complete. As to chemical impressions, they are prodigiously diversified, and varied, if we consider them in the extent of all the objects of Chemistry, and even as they are related to our Body. But it is not our business to give all the objects of Chemistry; and we can not yet enter into those that relate to our Bodies till

. All these chemical agents are in a fluid form, without which there is no action. Some phaenomena give doubt but not to the proportion of one out of a hundred, and fluidity is necessary to their acting on our Bodies. Of fluids there are two kinds, vapours and liquids

206 elastic and inelastic. Now these two Bodies as such have some difference in their manner of action and are more or less adapted to act upon particular objects and of more or less extent in the human Body. Bodies in the state of vapour are of more extensive power in the system. The action of Bodies is very often confined to a small portion of the system. In other cases, while the topical are little perceived, their effects are more generally extended over the system.

The Effects, of Impression are reduced to Stimulant or Sedative.

What I would call mechanical, is that which in sensible masses moves considerable parts of us, and what ever we think of pressing, bending, stretching we would suppose the produce corresponding excited motion. But we have examples of them proving sedative. But I believe their sedative effects might be said to be in consequence of their violence destroying the part affected ^{or the whole}. As for example in the electrical stroke. The pleasure of titillation and a high degree of pain may alter the mode of impression while the impression itself is stimulant. But chemical impressions are frequently sedative. We can scarcely conceive any operation, and it is impossible to conceive it to

be sedative. We must find out how motion in 207 one point can produce a cessation of it in another. I shall give you an Hypothesis which must be attempted. There is in our Nerves a fluid in hollow Tubes either confined or adhering. Now assuming, that there are various modes of operation which we can think of; and among the rest mechanical, impressions, act upon our nerves, which produce oscillations and vibrations to considerable distances, and therefore from the origin of extremity to the organs of sensation. Chemical operations may act in this manner which is analogous to sound, where vibrations are produced in the sounding body. And we have the motion of one body committed to another by producing these motions with heat, and this first by means of an elastic fluid, the air. The vibrations of other elastic fluids may be communicated to our Nerves and excite vibrations by direct impulse upon them. Light produces heat in Bodies by acting upon a fluid that is capable of vibrations, and Newton has shown that their action is not upon the solid Bodies themselves, but upon elastic fluids every where surrounding them. or by a subtle elastic fluid, the vibrations may be

which even of these we

208 employ we will not find the explanation of-
dative. Therefore I have ventured to say that it
is of a peculiar nature and mixture, & capa-
ble of being combined with other Bodies, and with-
out motion, variously modify its properties.
Mixtures in Chemistry destroy volatility & vapour.
Bring certain volatile fluids near to one another
and they soon become fixed Bodies. That is one
view of the ~~secret~~ operation of Chemical Bo-
dies on our Nerves. We can say no more till we know
it. There are some other operations in Chemistry
as antizymies which check fermentations. They
chiefly consist in preventing motions that would
arise by ^{this} contagion. The juice of the grate would
give motion by elastic air, but apply salts, &
no motion appears for years. Hence this then as
a necessary step before I proceed to the different
motions. I shall first shew you an application
or two of the Hypothesis which may be a presump-
tion for it. And first the explanation of a puzz-
ling Phenomenon "that the same impression
may prove both stimulant and sedative in dif-
ferent parts of the Body and in the same part at
different times; it is only supposing that one
part of the operation produces motion, when
acting upon our Nerves; but when it has entered

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into them, mixes with the fluid and com-209
bines or diminishes the motion; Now when I
speak of the subtle fluids to be insinuated in-
to our Nerves and applied to the elastic fluid
there, I can conceive how both the operations of
stimulant and sedative may be extended. Most
vapours or volatile bodies, are most active; and
most poisons are volatile Bodies. In their liquid
state they are perfectly mild and bland, but
in vapours most acrid and active. Most poisons
^{and their phenomena} then depend upon a very volatile part. We common-
ly observe that fixed salts and analogous Bodies in
operating upon the organ of Taste, are most gene-
rally topical and stimulant, unless they have the
effect of the modification of pain or pleasure;
whereas volatile Bodies are both more considerable
and extensive in their effects. And this leads to
point at an experiment that has so often deceived
us; we most frequently judge of the qualities
of Bodies by our taste, but this in other parts
may not be active, and converted into a vapour
may be remarkably sedative. As for example
camphor to the taste is stimulant but its ef-
fects on the Body are refrigeratory and sedative
and so of some other substances. —

I said that chemical impressions acted only in the fluid state, that of vapour and liquid; that those which acted by the former were more powerful.

I took occasion to give a new Idea of impressions, which is, that not only bodies in motion may be acting both upon the Solids and fluids of our Bodies, but that the elastic fluid in our Bodies may be affected in its mixture, and that in that way such things produce relative effects.

In what sort of Motion the several impressions, distinguished by perception, depend.

There is an elastic fluid in our Bodies, capable of impulse and vibrations. The impressions in seeing are no other than the vibrations of light communicated to our Nerves. The only difficulty is whether light is communicated by vibrations as the Cartesians say, and not by emanations as the Academicians insist. However every day the doctrine of vibrations prevail more & more, and I adopt it the more readily because the Phenomina of Heat and colour are better explained by it than by emanation. But why is not heat produced by the same means? because the vibrations admitted are too rare to produce

heat, as the light of the moon can not for the same reason do it on this globe. Now the reason why heat may not be produced, may be because the fluid in the extremities of the optic nerve propagates its impressions to the origin of the nerve, and its vibrations applied to such a long surface, are too rare to excite heat as well as light. The focus of a burning-glass thrown into the air is not perceived & when taken away leaves no heat because the vibrations are distributed over a large space, and not returned soon enough to produce heat whereas applied to a body in one point it instantaneously consumes it by burning. As to hearing it appears that the oscillation is not applied to the fluid of the Nerve alone, but to the solid part of the Nerve, since hearing is performed or assisted by the vibration of solid Bodies. The sound is transmitted thro' the air, applied to the membrana Tympani and is much assisted by the Bones of the Ear, which last circumstance appears in a deaf person to whom speaking over the top of the head, and producing an oscillation in the Bones of the Cranium, gives hearing; and by taking ^{the end of} a long rod in your teeth you hear a sound at the other end which otherwise you would not perceive. &c. &c.

212 Hæw has published among other things the
tremors of solid bodies communicated to his body
and giving him (tho' Deaf) perception of sound.
By laying his finger on a Violin or harpsichord,
he could distinguish the music so as to be
able to put it down in writing. Now the objec-
tion taken from the soft and pulpy nature
of the Nerves seems to be not without founda-
tion; but still that may be an analogy not
sufficiently understood. There may be soft
bodies capable of oscillations, and certainly dis-
quids do propagate sound. The phenomena of
hearing seems to prove our nerves to be capable of
vibrations. As the vibrations of the air being
being communicated to the Nerves in our Bodies,
it is so far a peculiarly modified vibration as
to correspond to that performed by solid Bodies.
as to smell that depends on Bodies in the state
of Vapour, whether you suppose them taken
up and deposited in the air, or whether you
consider them as elastic vapours distinct from
it, you may consider them as constantly oscil-
latory fluids varied by the subtilty of the
matter of which they consist. Now here is an os-
cillation of an elastic fluid, to be communicated

to that of our Nerves. But it is not motion only 213
that is communicated, it is commonly some affect
in the way of mixture. First in the case of many
bodies that act upon our organ of smell the per-
ception is often inconsiderable while the effect is
very great. Very frequently sedative effects are pro-
duced by odorous Bodies. To show that ^{some} Bodies act
in the way of mixture I reserved an argument for
this place. The gentlemen of the Academy of Bo-
logne have made some experiments in this sub-
ject and found the doses very exactly corresponding
to the bulk of the animals respectively. We find the
smallest portion of the tongue is sufficient for
taste. But what depends upon mixture is ve-
ry much in proportion to the extent of surface of
the mass to which it is applied, and this is probably
because they operate in some measure in the
way of mixture. Poors may be enveloped in air, but
they are not very miscible in it, and they appear
to be more disposed to unite with Oether. Hence
it is that they continue so long adhering to the
surface of bodies, and some will remain if
not washed away, for ages, and yet the air must
have been changed a thousand times. There has
been another account of this matter taken from