CLASSICS IN INFECTIOUS DISEASES

On Continuous Molecular Changes, More Particularly in Their Relation to Epidemic Diseases

John Snow (1813–1858)

London


[Editor's note: John Snow has become so well known for his epidemiologic investigations that it seems, at times, almost unnecessary to read his work. Those who have failed to read his investigations of the mode of spread of cholera have missed an insight into an indefatigable collector of data, who analyzed his findings with great skill and perception. Snow's vision and capacity for analytical thought are shown in this essay, which is even less read than his work on cholera. The essay, which was delivered in 1853 to the Medical Society of London, indicates the intellectual framework on which the discoveries of the decade or two later were to be built.]

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The Preface

The title to these pages may, perhaps, seem rather obscure, on account of the various senses in which the word molecular has at different times been employed. I do not, however, know any better term by which to express all that refers to the attraction which exists amongst the particles of matter at in- sensible distances.

The word chemical is restricted to expressing what relates to the composition of bodies, and does not include properties, such as solidity and fluidity, which are called physical; nor some of the processes that we call vital, such as the formation of fibres and cells. It is especially desirable to have a general term to include what is understood by the words physical, chemical, and vital, in order to avoid the dis- putes respecting these two latter words... and the needless antagonism in which these words are sometimes placed towards each other.

All changes of composition whatever, whether occurring in a test-tube or in the living brain, are properly included amongst chemical changes; and all that takes place in living structures has a right to be called vital, whether it differs from what occurs elsewhere or not. Thus, whilst the terms chemical and vital have each a separate significance, they have a certain ground in common, since changes of composition in living beings are at once both chemical and vital, and belong to both chemistry and physiology; just as fossil animals belong to both the mineral and animal kingdoms, and to the sciences of geology and zoology at the same time. To dispute whether the formation of urea or cholesterol is a chemical or vital process, is as useless as it would be to dispute whether a fossil ichthyosaurus is a mineral or an animal, and whether it belongs to geology or zoology.

I beg the reader to remember that the term oration proceeds from the laws of the Medical Society, and not from any claim of mine to be considered an orator. . . .

The Oration

The Medical Society of London [has] conferred on me the honour of electing me to deliver the oration for the present year. . . . It is my intention on the present occasion to make a few remarks on some of the chief phenomena of living beings. . . . The first of these forces is called the attraction of gravitation; and the term chemical attraction, or chemical affinity, includes more or less of the second force, according to the more or less extended sense in
which the word chemistry is understood. The ef-
fects of gravitation on living beings are of a simple
kind, and are pretty well known; therefore they
need not detain us. With respect, however, to the at-
traction which takes place at insensible distances,
the case is different. The results of this attraction
in living beings are very complicated and impor-
tant, and they require much investigation. . . .

There is no distinct line of demarcation between
vital processes and those which are not vital. Vinos
fermentation, for instance, has been generally looked
upon as a merely chemical change; yet it has great
claims to be entitled a vital process. It is always ac-
 companied by the formation of the cells or spores
of the yeast fungus—the decomposition of the sugar
into alcohol and carbonic acid bearing a direct rela-
tion to the quantity of yeast produced.5 Many per-
sons would doubtless say that the formation of the
spores is a vital process, and the production of al-
cohol and carbonic acid a chemical process insepara-
ble from it. According to this view, whilst cell de
development is undoubtedly a vital process,6 digestion
and the formation of compounds to be secreted or ex-
crated are chemical processes. There is no objection
to such a distribution of terms, but it must be remem-
bered that the decomposition of sugar into alcohol
and carbonic acid is as closely connected with a pro-
cess of organization as are the sensibility and con-
tractility of animal issues. This blending together
of what we call vital and what we call chemical, need
not surprise us, however, when we consider that all
changes of composition, with their attendant phenom-
ena, whether taking place within the living body or
not, are alike the result of the attraction or affinity
which exists amongst the ultimate atoms or molecules
of matter. . . .

Procreation by sexes, which is the most usual mode
of generation throughout both the vegetable and an-
imal kingdoms, appears to have the effect of prevent-
 ing deviations from the form and character of the
species; for gardeners are enabled, by means of cut-
tings, shoots, bulbs and tubers, to propagate many
cultivated varieties of plants which differ greatly
from the species to which they belong, and would
soon revert to it if able and permitted to propagate
by the sexual method, that is by seeds.

As organized beings rise in the scale of complex-
ity, the points of connection between the individu-
als of one generation and those of the next increase
in number and extent. In the lower classes of inver-
tebrated animals a single germ yolk serves for the
production of numerous individuals, and in some
cases for the production of several generations; but
in the higher invertebrata, and in all the classes of
vertebrated animals, "only a single, individual is
propagated from each impregnated ovum."7 We ascen-
d through fishes and reptiles to birds, the number
of the ova diminish and their relative size in-
creases, till in some reptiles, and in all birds, the
ovum, with its attendant yolk and albumen, is
sufficient for the development of a nearly perfect
animal, which undergoes all its metamorphoses be-
fore it has escaped from the shell, or obtained any
nourishment beyond that contained in the egg.

In the class mammalia, with the exception of the
marsupial order, the embryo becomes rooted, by
means of the placenta, in the uterus of its mother,
from which it thus derives the materials for its de-
velopment and growth, up to the perinatal period of its
birth. The young of all mammiferous animals are also sup-
plied by the mother, for a considerable period after
birth, with nourishment secreted from her own
blood; and medical men have ample experience, as
regards their own species, how much the prospect of
health and life is diminished by the deprivation
of this natural supply of nutriment.

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6 Schleiden's is of opinion that the yeast cells originate without the influence of a living plant. If it be so, their formation may
be looked on as a natural link between the nons-a and s of vital affairs of ordinary chemistry and physiology. The words of
Schleiden are as follows: "At a certain tempera-
ture, which is perhaps neces-
sary to the chemical activity of the mucous, there originates, with-
out as it appears the influence of a living plant, a process of cell
formation, the origin of the so-called fermentation (fermentation),
and it appears that it is only the vegetation of these cells which
produces the peculiar changes that occur in the fluid."
7 As we ascend through fishes and reptiles to birds, the number of the ova diminish and their relative size in-
creases, till in some reptiles, and in all birds, the ovum, with its attendant yolk and albumen, is
sufficient for the development of a nearly perfect
animal, which undergoes all its metamorphoses be-
fore it has escaped from the shell, or obtained any
nourishment beyond that contained in the egg.

Owen on Purthergenesis, p. 62.
In many birds and mammals there is a further connection between one generation and the next, in the way of teaching the young, to a limited extent, how to procure food and escape danger. In the human species, enjoying the faculty of speech, this connection between succeeding generations is much more intimate. . . .

The communication of certain molecular changes taking place in the brain is by no means confined to the connection between parents and offspring, but extends collaterally in all directions, by means of vibrations in the air, or in the ethereal medium which prevades space. If the brain of an animal is in a particular state of molecular action, from any object that excites fear or joy, it may cause a similar state of the brain in others of its species, by uttering a cry, or merely assuming a particular demeanour. The faculty of speech gives to man a power of communicating his complex feelings and ideas, far exceeding that of the lower animals and the invention of literature has greatly increased this power in civilized nations. By speech, not only can fresh sensations and ideas be communicated, but also that communication of them called remembrance, by which they revive after, it may be, a long interval of suspended action. By the aid of literature, indeed, knowledge committed to writing may lie dormant for centuries, like the ears of wheat in the hand of the Egyptian mummy, and then again take up the process of growth, to increase and spread in another part of the world.

In addition to the series of continuous molecular changes having for their result the preservation of the individual and the species, there are others, occurring in living beings, which have an opposite tendency; they divert part of the substance of the individual from the actions which are natural to the species to another kind of action, in consequence of which this substance is employed in the multiplication and increase of the matters morbit of communicable diseases — an extensive group of maladies, each case of which is caused by some material that, as a general rule, has been produced in the system of another individual. These origin of these diseases, for aught we can tell may be as remote as that of the beings they infest and exist on.

The communicable diseases — I use this term in preference to contagious, for various reasons* — the communicable diseases, to which the human species is liable, are chiefly as follow: — syphilis, small-pox, measles, scarlet-fever, typhus, typhoid and relapsing fevers, erysipelas, yellow-fever, plague, cholera, dysentery, influenza, whooping-cough, mumps, scabies, and the entozoa. Some persons do not admit the whole of the above diseases to be communicable, and, on the other hand, the Regius-Professor of Medecine in the class of zymotic diseases, although there is no evidence that these complaints are communicable. . . .

The material cause of every communicable disease resembles a species of living being in this, that both one and the other depend on, and in fact consist of, a series of continuous molecular changes, occurring in suitable materials. The organized matter, as we must presume it to be, which induces the symptoms of a communicable disease, except in the case of the entozoa, can hardly ever be separately distinguished, like the individuals of a species of plant or animal; but we know that this organized matter possesses one great characteristic of plants and animals — that of increasing and multiplying its own kind.* In the instances of syphilis, small-pox, and vaccinia, we have physical proof of this increase, and in other diseases the evidence is not less conclusive.

The molecular changes taking place in the matters morbit of some diseases resemble the changes in many living beings in another respect also: they permit of being suspended, under certain circumstances, and recommence at the point at which they ceased. Thus the matter of variolus and of vaccinia can be carried, in the dry state, to distant parts of the world without injury, like the seeds of a plant.

No evident effects are produced at first by the reception of the material cause of any of these diseases. There is always a definite period, of longer or shorter duration, before the illness commences, which is called the period of incubation. As regards the matters morbit itself, this [is] a period of something more than incubation; it is a period of reproduction. All substances capable of causing a disturbance in the animal functions produce symptoms from the moment of their absorption or imbibition, when introduced in sufficient quantity; but

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* The word contagious is employed in a very different manner by different authors, and it could scarcely be employed, if any regard were paid to its etymology, to express some of the indirect modes of the communication of disease alluded to in the following pages.

the specific animal poisons, as they are called, are very rarely, if ever, introduced in such quantity as to produce sensible effects; the disturbance in the system, which constitutes the diseases they induce, being due to the crop or progeny of the matter first introduced.

One character of communicable diseases is, that they are apt to be extremely prevalent at particular times and places. This character, which arises entirely out of their communication from individual to individual, has obtained for many of these diseases the name of epidemics—a name which may be applied to nearly all of them, although some are prevented, under ordinary circumstances, from showing their epidemic character. Thus small-pox, for instance, keeps a pretty even course in this metropolis, because there is a steady amount of vice for its support, and a still greater amount of virtue to keep it in check; but when it is introduced amongst a community of savages, indulging in promiscuous intercourse, it rages as a fearful epidemic. The extent of population and of intercourse has great influence over the epidemic character of communicable diseases. The various irruptive fevers are constantly present in London, and are only liable to fluctuations in their prevalence. In less populous districts, however, there are not enough subjects to support their constant presence. One or other of them is often absent for a number of years, and, when re-introduced, spreads to a great extent.

There is one disease which neither the metropolis, nor the country at large nor even the whole of Europe, will supply with victims except for a time. The cholera has been twice spread over the world within the memory of the present generation, and seems to be dying out a second time everywhere but in the south of Asia. Fatal as it is to the human species, it is itself so difficult of support that the world seems scarcely large enough for it, and, were it not for its pastures in India, it would be in danger of passing altogether out of existence, like the dodo of the Mauritius.

So far as can be learnt from what remains of ancient medical literature, the communication of diseases was not generally recognised till a recent period. Even Sydenham did not recognise the communicability of any acute febrile disease except the plague. He did not even recognise the communicability of small-pox.

For want of knowing any other cause, epidemics were attributed, by the ancients, to the atmosphere, without any evidence; just as political and social events were believed to be occasioned by the stars. Now as people are not only exposed to the atmosphere, as soldiers in battle are to bullets, but are actually immersed in it, as fish are in the sea, it became necessary to explain why certain persons were attacked and others not attacked, and the word predispension was used as affording an explanation. The alleged predisposition, however, was nothing visible or evident; like the elephant, which supports the world, according to Hindoo mythology, it was merely invented to remove a difficulty.

As the composition and physical properties of the air began to be better understood, it became evident that the atmospheric hypothesis of epidemics did not explain their phenomena, even with the assumption of a predisposition existing in some persons and not in others. It is not possible, for instance, that a disease caused by anything in the general atmosphere should progress in opposition to the wind, or should remain for weeks in a place before extending to the next parish on either side . . .

It is quite possible, and, indeed, almost certain, that the material cause of some communicable diseases may be wafted a short distance through the air, like the seeds and spores of many plants. The matter of small-pox pusules, for example, retains its powers after being dried, and may be shaken from articles of clothing, and thus wafted through the air. This is probably true of other diseases. It is, however, only a mode of communication of the disorders in question, and would not warrant us in speaking of their atmospheric origin. . . .

When the communication of diseases began to be recognised, it was thought to depend, in most cases, on effluvia given off from the patient into the surrounding air; even syphilis, for some time after its appearance in Europe, was believed to be propagated in this way, and persons suffering from it were driven out of the towns and villages to live or die in the fields, lest they should infect others with their breath, although the disease was not attributed to any misconduct on their part. Now as effluvia of any kind must reach all who approach the patient, the idea of a predisposition existing in some persons and not in others, has been retained to explain why certain individuals only are attacked with the diseases. We are informed by M. Ricord and others that when the pus from a chancre, in its active or increasing stage,
is introduced by inoculation, it never fails to com-
municate the disease. The matter of small-pox
pustules hardly ever failed, when inoculation was
practised, to cause the complaint in those who had
not had it already; and vaccination does not fail more
than once in several hundred times, when properly
performed. So far, therefore, as we have analogy to
guide us, we are warranted in concluding that when
the morbif matter of any disease is received into the
system, in the way required in that particular dis-
ease, it is almost certain to produce its specific ef-
fects, except in the instances in which the patient has
gained an immunity by a former attack. Conse-
quently, until it can be shown that the matters morbi
of any communicable disease has really entered the
economy of those who do not take the malady, there
is no reason to invoke a supposed predisposition, or
predisposing causes, to account for its existence in the
counties in which we find it. To be of the human
species, and to receive the morbif poison in a suit-
able manner, is most likely all that is required. 1 . . .
The influence of climate and season have been much
overestimated, having been even accused of causing
epidemics. We constantly, also, hear climates called
healthy or unhealthy; which is as incorrect as it would
be to call them fruitful or barren. California, for in-
stance, was proverbial for the healthiness of those
who resided there, and this healthiness was attributed
to its climate. No sooner, however, was the discov-
ery of gold made, than the cholera was conveyed
across the mountains, by crowds of people, who left the
route strewn with the dead bodies of those who died
on the journey. Dysentery and other diseases began
to prevail amongst the diggers, and the medi-
cal men found plenty of employment; although it
cannot be supposed that a few hundred people,
scratching here and there for gold, had altered the
climates of country. . . .

There is one circumstance which seems to indi-
cate that the specific cause of intermittent fevers un-
deges a development or multiplication within the
system of the patient,—it is, that a period of dorm-
ancy, or incubation, has been observed, in many
cases, between the visit to the unhealthy locality and
the illness which followed; for, as I have already
remarked, every poisonous or injurious substance
causes symptoms as soon as it has been absorbed in
sufficient quantity. . . .

But, to return to those diseases which are known
to be communicable, there are certain spots, more
limited than the districts or localities previously men-
tioned, in which they find easy means of communi-
cation,—fallow to the courts and alleys crowded with
the poor. It happens that there is generally no lack of
offensive gases or disagreeable smells in these
spots. Now it is well known that the gases arising
from decomposition cause no fevers or other epi-
demic diseases, when they are made artificially in
the laboratory. The same is true when they occur
more naturally in the dissecting room; and it has also
been proved that persons who get their living by
working amongst decaying animal and vegetable
matters are not more liable to these diseases than
other persons. 4 Still there are some medical men, and
a benevolent section of the general public, who at-
tribute the excess of epidemic disease, found in
crowded and poor localities, to what are called tox-
ious effluvia. They cannot say that these effluvia pre-
dispose to the diseases, for persons from the coun-
try are often attacked too soon after their arrival in
such places to allow of this mode of action, and they
do not inquire whether peculiar faculties may not
exist for the conveyance of specific virus from one
person to another, but they hold that the noxious
effluvium, together, perhaps, with an undefined some-
thing in the general atmosphere, may cause or in-
crease any epidemic disease whatever; and, when a
nuisance is discovered, the prevalence of any kind
of disease at the place is said to be explained, al-
though we are not told how. The gentlemen who hold
these popular opinions do not seem to recognise spe-
cific causes of disease. They are, with respect to dis-
ectes, in the position that some of our ancestors were
in with respect to plants and animals, when they be-
lieved in spontaneous or equivocal generation, and
thought that dirt engendered vermin, and that
mushrooms arose from horse-dung. . . .

Amongst the poor, who are less unfortunately sit-
uated, there is often very little cleanliness, and, when
a number of persons reside, sleep, and eat in a small
room, in which also the cooking is conducted, it is
extremely difficult, when an individual is confined

1 I do not deny that the period of life, being ill or well
nourished, and other evident conditions of the patient, in-
fluence his liability to certain epidemic diseases. The predisposi-
tion objected to above is that which is assumed, without any
symptoms of its existence, merely from the fact of the patient
taking the disease.

4 See Bancroft on Yellow Fever.
to bed by illness, to prevent his excursions being par-
taken of by all the inmates; indeed, with the un-
 cleanly habits of many of the poor, this is altogether
impossible. Under these circumstances we find that,
when typhoid fever or cholera enters such a dwell-
ing, it is very apt to go through the house, as the
phrase is. It often attacks the friends also, who visit
and eat and drink with the inmates, whilst the med-
ical and clerical visitors escape. But when cholera
or typhoid fever occurs in cleanly families, where the
nursing, the cooking, the sleeping, and the eating
are done in separate apartments, it is hardly ever found
to spread.

It is not improbable that the specific cause of in-
fluenza and measles is drawn in with the breath, as
these diseases affect chiefly the respiratory organs,
and spread almost equally amongst all classes of the
community. . . . It has been said that animal poi-
sons do not act when taken into the stomach; but
this is incorrect, for cantharides, the sausage and ba-
con poisons, and others, act when taken in this man-
ner; and it should also be remembered that the virus
of a specific disease is not strictly a poison, in the
sense of that of the vipera, for it is capable and re-
quires to be multiplied in the system, before its ef-
fects appear.

There is evidence tending to show that typhoid fe-
ver, yellow fever, and plague, as well as cholera, are
communicated by accidentally swallowing the mor-
bid excretions of the patients, and that these latter
may sometimes be conveyed to a distance with the
drinking water, or other articles of diet, without los-
ing their specific properties. Thus the communica-
tion of these diseases may be more or less direct or
indirect, even when it takes place virtually in the same
manner. The first authenticated case of cholera
which occurred in London in the autumn of 1848,
was that of John Harnold, a seaman of the steam
ship Elbe, newly arrived from Hamburg, where the
disease was prevailing. He died in a lodging at Hors-
leydown, near the river. The next case was that of
a man who came to lodge in the same room; and
a few hours afterwards cases occurred in lower Fore
Street, Lambeth, and in White Hart Court, Chel-
sea, amongst people who had no water for drinking
or any other purpose, except what was obtained by
dipping a pail into the Thames. Thus the cholera poi-
son from John Harnold appeared to be distributed
like the seeds of a river-side plant, some of which
germinate and grow up by the side of their parent,
whilst others are conveyed some distance by the tide,
and take root on another part of the shore.

Those sudden extensions of the cholera, which are
called outbreaks, were in many cases due to the mix-
ture of the cholera-evacuations with the water used
for drinking and preparing food. This was shown to
be the case in the Wandsworth Road, in Bermond-
sey, and in Rotherhithe, during the summer of 1849.22
It has been often argued that sudden outbreaks of
cholera are incompatible with its propagation from
person to person, but we know of no circumstances
to restrict the number of persons who may receive
the disease from one or two patients, under favoura-
ble circumstances for the distribution of the mor-
bid matter. . . .

Medical men are naturally apt to form their opin-
ions respecting the communication of diseases from
their own experience, rather than from the general
history of the maladies, and thus they believe in its
contagion, when a disease, such as cholera or typhoid
fever, generally spreads directly from person to per-
son in their practice; but in districts or connections
in which the indirect and less obvious mode of con-
tracting disease is, from physical causes, the prevail-
ings one, they are apt to become what are called non-
contagionists.

It may very fairly be asked whether communica-
tion of diseases do not sometimes arise spontaneously—
that is, from other causes than their communication,
just as ordinary combustion, putrefaction, and some
other continuous molecular changes, very often com-
monly occur, from various causes, without any con-
 tinuity with previous changes of the same kind, and
it is not improbable that some communicable dis-
eases may arise, so to say, spontaneously. The
erispetalous inflammation, for instance, which at-
tacks the neighbourhood of wounds, probably arises
now and then without being communicated; other-
wise we must suppose the material which causes it
to be almost as widely diffused as the spores of some
of the fungi. There is, however, great reason to be-
lieve that the larger number of communicable dis-

22 Snow on the Mode of Communication of Cholera, p. 12;
eases never arise from any other cause than the commu-
nication of the specific virus from a previous patient. Dr. Watson has given very strong proofs of this, in regard to small-pox, in his lectures, and proofs almost as strong might be adduced in respect to other diseases. We know very well from history that the plague spreads fearfully in this country, when it is imported, and, if it ever arises spontaneously, why should we have been without a case of it for nearly two centuries? We sometimes hear it asked, "Then how did the first case arise?" The question might as well be asked with respect to the first tiger or the first upsæ tree; but our ignorance of the first origin of natural phenomena need be no obstacle to the investigation of their present causes. . . .

With respect to preventing the communication of disease, it is worthy of remark that there are two dis-
eases whose mode of propagation is well known to almost everybody, and almost everybody has it in his power to avoid them — I allude to syphilis and the itch. It will perhaps one day be seen whether other communicable diseases may not be as easily avoided, when their mode of communication is known. In the meantime it is very well ascertained that cleanliness is a great protection against many of them, as are also space, daylight, and ventilation. The cleanliness which, it may be observed, cannot be attained without sufficient space and light, should not be a cleanliness for mere appearances, but should be a ra-
tional cleanliness, like that by which the chemist keeps his tests pure and distinct, and the farmer his land free from weeds. There should be not only per-
don cleanliness, but cleanliness in every department of the household — cleanliness in builders and owners of house property, to deter them from sinking wells so near to cesspools and drains, that their contents may percolate without proper filtration — cleanliness in water companies, to prevent them from sending water containing sewage to their customers, as was done on the south side of the Thames till very lastly — and cleanliness in sanitary reformers, to de-
ter them, in their fear of offensive effluvia, from abolishing cesspools and having the sewers flushed, and thus sending all the recent excrementitious mat-
ters into the rivers, until they have ascertained that people are no longer obliged to drink the water of these rivers. . . .

The prevention of epidemic or communicable dis-
eases is a subject which deserves increased investi-
gation. These diseases influence the life, the death, and the numbers of the human race, more than all other causes. The very learned physician Dr. Gor-
don Latham is of opinion that the downfall of the Roman Empire was due as much to several epidemics as to any other cause; and although I am far from apprehending any such calamity now, as "a speedy return of the middle ages," there are cir-
cumstances occurring which deserve our vigilance. The increased and more rapid traffic between nearly all parts of the world, especially that by means of large steam-ships, renders it probable that diseases, hitherto confined to particular divisions of the globe, may gain a wider range, and thus increase the num-
ber of diseases in nearly every country. For now, when the commercial interest and influence prepon-
derate over every other, the day is gone by for strict quarantine, which, indeed, we ever but a doubtful measure, as it was liable to evasion, and could not be enforced on the smuggler.

The question of contagion in various diseases has often been discussed with a degree of acrimony that is unusual in medical or other scientific inquiries. The cause of the warmth of feeling that has been displayed has, in most cases, probably been unknown to the disputants. It is the great pecuniary interests involved in the question, on account of its connec-
tion with quarantine. In the preface to his work on the Plague of Aleppo, Dr. Russell says, "But how-
ever indisputable the act of the plague being contagi-
ous may be deemed by modern physicians, it may be remarked that it has been strongly opposed, as often as the subject of quarantine has fallen under the deliberation of the legislature; and the public, at such times, have been constantly pestered by an inflation of pamphlets, which, without advanc-
ing anything new, merely retailed arguments which had long before been refuted."

Since 1791, when the above was written, the com-
merce of this country has increased a hundred-fold, and for every ten thousand pounds that were jeop-
ardised by quarantine then, a million is in danger now. . . .

The mode of propagation and the means of prevention of epidemic diseases require, as I said, increased investigation; and if any inducements were wanted to stimulate my present audience to that in-
quiry, it would only be necessary to remind you that, by investigating one of these diseases, a former Fel-
low of this Society was enabled to make the greatest discovery that has ever been made in the practice of medicine, and to render the greatest benefit to his species which they have probably ever received. I need hardly say that I refer to Jenner.