Influence of Micro-organisms upon Civilization.

by Victor I. Sandt, '94.
Synopsis.

The following article treats micro-organisms in a general way, first as builders, second as scavengers, and third as disease producers.
To have a good, clear understanding of the following article it will be necessary for one to know just what is meant when the term micro-organisms is used. I shall therefore define it as follows:

Micro-organisms are simple, cellular, organize, beings, either vegetable or animal, which are insufficient in size to be discerned by the unaided eye. While this definition may not be true in the strictest sense of the word it will however do for all purposes in the following article.

Micro-organisms are divided into two great classes, namely, vegetable and animal. The vegetable organisms may again be divided into plants which chlorophyl (Schizomyces) and plants with algal-chlorophyl (algae). But by far the greater portion of the vegetable organisms belong to Schizomyces while most of the animal organisms are of the infusoria type. In treating this subject I shall speak of these
minute bodies in their three
great spheres, viz. micro-organisms
as builders, micro-organisms as
scavengers, and micro-organisms as
disease producers and their effects
on man.

In the discussion of the first
head let us look at the distribution
of these diminutive bodies. Where
they are found. And in what quantity.
For the first, I must say, above the
earth, on the earth, and under the
earth. Every breath of air we draw
into our lungs contains them
in enormous quantities; every drop
of water which we drink, and
that which we do not drink is
infected; every particle of food
which we eat contains them;
every foot of earth contains countless
thousands; the saliva and
elementary casual streams with
these minute organisms. Every
thing, living and dead, organic
and inorganic, is infected.

As its members, it is simply
impossible to conceive the quantity of these minute beings in even a single cubic yard of dust taken from the streets of some of our large cities. From what has been cited above it may be possible for us to draw some conclusion as to the abundance of these small beings. Then we should not be surprised when we find that—in the ages which have passed, they, in their remains, have built structures which far surpass the Egyptian pyramids in size and the marble buildings of Greece in beauty. In fact, these works are themselves made of the very stone which were built up by the remains of minute animal life.

The chalk cliffs which gave England her first name were formed by the deposit of microscopic shells, the remains of _Pleuronega_. These cliffs have been estimated to be five hundred
feet in thickness and covers the greater portion of England and Wales, also the western part of France and a small portion of Norway and Sweden. And when we are told that Ehrenberg estimated that one cubic inch contained forty-one billion of these shells. It will begin to have some idea in what countless numbers these bring once inhabited the earth. But we must remember that it took ages and ages to accomplish all this and that they may be as numerous today as they were millions of years ago. But fact—there are deposits of these small bring going in our own time. At the bottom of the sea there are deposits many feet thick of these small remains, and when time shifts the ocean bed to some other portion of the globe these deposits will harder and form chalk beds like those of old England.
There are also many other deposits of these small beings as the muds of Africa which some of the tribes use as food. This mud is almost wholly composed of microorganisms as is also the "mountain meal" of France which is mixed with flour and eaten. Even the plaster on our walls which makes our houses comfortably is composed of these minute bodies. And the bit of flint was an absolute necessity for our forefathers comfort. From it they struck the tiny spark upon the tinder and so kindled the fire which cooked their food and gave warmth to their bodies. It also tipped their arrows and spears; and later they fastened it upon their trunks of which they obtained the necessary subsistence to sustain life, and protected their homes and those dear to their hearts from the cruelties of the savage red man; and with it
they fought for and obtained the freedom which we now enjoy. This stone is now known to be composed of the silicon remains of the diatoms, a microscopic form of alga. The finding of these remains in rocks which show no fossils of any other forms of life would lead one to think that these minute forms were the first inhabitants of this globe and such has actually been proved to be the case by all the eminent geologists and scientists.

We are now ready to turn our thoughts in the direction of our second head i.e. micro-organisms as scavengers. It was observed many years ago by some of the learned men that whenever a bit of earth or some other organic substance was allowed to lay for a few days it—literally imbued with minute animal and vegetable life. It was long supposed that
these little living bodies were produced spontaneously. Even the Greek philosophers believed in this theory, and (Plato?) for some reason for spontaneous production of mice he stipulates an iron pot and places some corn in the bottom, stuff the pot full of old dirty linen cloth and in a few days the corn will be sour and in its place will be from one to six full grown mice. These mice are often different in color and of different sex and often more than one species.” Another gives the following receipt — take a brick and hollow out the middle, put in some corn meal and place another brick over it, put the whole in a damp place, and in a few days the meal will be changed into a full grown centipedes.”...
mist of ignorance the peoples of course gave up these extreme ideas, but the theory of spontaneous production had many firm believers and supporters even in the beginning of this century, and was not entirely routed till Louis Pasteur and several other scientists showed when they came from and how they came. But to return to the subject—of the meat. Had these living beings got them in such immense numbers? and what are they there for? What deceived the people into the fact of so many of these individuals being in the meat? They could not understand how they could come from the air or the earth in such vast numbers. The fact is that probably only one individual alighted on the substance, and it immediately reproduced itself
by cell division and these new individuals in turn divided; and when we consider that it only takes a few minutes for these beings to reproduce we can see that in a very short time millions and millions of these organisms would be there eating up the meat. Yes they are there for the sake of the nourishment which it offers and as they eat up the meat—so they devour all other organized substances.

When we go into the quiet woods we little think that on every hand there is a great banquet taking place; but such is the case. Banquets which feed millions and millions of individuals and thousands and hundreds of thousands of generations. Every old dead tree is one of these grand spread out to these tiny things. One generation passes by and portions of the food and pass on...
away while their posterity
take their place and so on and
on till there is nothing left
of the old tree but the dark
fick humus from which other
plants spring forth and grow.
As in the woods so on the
prairie and else where; these tiny
organisms eat up the waste, we
might say, and so make it possible
for man and other organized
beings to live on this earth and
enjoy life. Did I say make it possible for man to live? Yes! For
without these micro-organisms
nothing would decay, but would
remain in a state of perfect preser-
vation. Imagine then, if you can,
all the trees, grasses, leaves, and
the bodies of animals that
have lived since the earth was
created. All these would be piled
up on top of each other, every
which leaf, just as they fell
when they died. Do you think
there would be much room
for you and me? And if there
were would it be possible
for man to enjoy himself when
on every hand his gaze would
meet the ghastly stare of some
of his ancestors? Or would
it be pleasant to go climbing
over miles and miles of rubbish
and then still as far as your
eye could reach, see nothing
but rubbish and ruins? I ask
sure it would not. I think
than that no one will deny
the statement that micro-
organisms are the greatest
seaworms on earth.

This brings us up to the
third and last topic. Micro-organisms
as disease producers and their
effects on man. These organisms
are generally bacteria of some
form and nearly all belong to
the vegetable class and are
divided into three great classes
called Micrococci, Bacilli, and
V. I. Z. Micrococci, Bacilli, and
Virilla. The
Micrococci is a globular or ellipsoid
shaped body and is the germ of some of our fatal diseases.
Bacilli is a rod shaped germ, and is the most common of all the
disease producing germs. It is from this germ that the general
limn bacteria too derived. Spirilla is a spiral shaped rod and
a few of our diseases are produced by this germ.

The theory of germs causing
disease had gradually but surely
been making progress for a
hundred years past, when in
the middle of the present century
such men as Pasteur and Koch
fixed it forever. Many are the
diseases which have been proven
to be the result of micro-organisms.
These some of the most common
are measles, diphtheria, tuberculosis
or consumption), actinomycosis,
smallpox, cholera, splenic fever,
typhoid fever, glanders, and a great
many others. But to prove that a
disease is caused by a germ is no
easy matter. We may find a germ in connection with a disease but this proves nothing, it may be simply a coincidence. The germ must be isolated from all other germs, and this sometimes proves too by very difficult task, and by inoculation in a healthy animal reproduces the disease. Once it is not enough for there may be happen as in this case two is twice or three times sufficient but after very many times we may feel reasonably sure that we have found the germ of that particular disease.

There is often a difficulty of finding the germ in the first place before we can isolate it. A great many germs are so transparent that they cannot be seen in the tissues. The use of stains has somewhat alleviated this difficulty, but then it sometimes takes years of labor to find the particular stain.
which will stain a certain gem. If now by these long and
extremely slow methods that
the germs of diseases were
discovered, and until the germ
of a disease is known little
or nothing can be done with
it. The physician does not know
how to treat it or what
measures to take to prevent
its ravages.

For instance let us take as our illustration that
dread disease which over our
inhabitants. The black death came
among men, men were fitted for it
to work its most direful
results. The country was full of
fifty years and restitution was
there was no nor the high
ways were full of robbers so
that people were compelled to
live in crowded cities
surrounded with high walls
and little or no attention was
paid to sanitary measures.
as eaten the disease made its
invasion it had the best of
soil to grow upon. Thousands
of persons died in a single
day. In Norwich fifty seven thousand
died in a few days. In London
thirteen acres of land was added
to the burial grounds. Ten thousand
died in one night and over
half of the population was
destroyed. Nothing could be done
to stay its ravages until it
was discovered that it was
caused by a germ. Then by cleaning
up the streets and tearing down
the vile and filthy places and
by introducing strict sanitary
measures it was checked and
died now when it breaks out it is
quickly brought under control.
This one disease alone has done
more for mankind than any
other one thing. It has reduced
the population by succumbing and
the weak and puny ones and
left the strong and vigorous
to repopulate the earth thus making a stronger and harder race. It also introduced cleanliness and now every one knows that those who leave their homes and bodies in a filthy condition must suffer the consequences.

A few years ago Dr. Roch announced to the world that he had found the germ of that dread disease which annually causes one seventh of our deaths. There is not a neighborhood but that has its victims of consumption. The patient has only a cold at first. Then gradually grows worse until finally he lies lain away to rest and no return to work work and nothing remains to tell the story save the broken hearts and sad homes.

There are many other instances which I might enumerate but it is useless I have already given enough to show
that micro-organisms are at one and the same time man's greatest benefactor and his worst enemy. Without them he could not live and with them he has one continual struggle for existence. They are a necessary evil and we should treat them as such. Use them for the good they do and protect ourselves against their evil results. Just because they are away we should not treat them as of no practical use; for they have a significance in the economy of nature, a usefulness to man, and a value in the industrial arts.