Entophytes
found
on man.

by


March 1851.
To

John Hutton Balfour, M.D., F.L.S., F.R.S.E., &c.,

in admiration of his eminest position as a Botanist, and

in remembrance of his uniform kindness to the
Author, this Thesis is

dedicated.

[Signature]
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Introduction

The lower orders of vegetation are small and insignificant things when viewed relatively, but every day experience teaches us that we must not measure the works of the Creator by rule and weight, and that a living cell, with its wondrous powers of evolution, bears as much significance to the reflecting mind, as any of the vast expanse of stars "which deck the brow of night".

Our fathers gazed with astonishment at the great system of worlds the telescope opened to their view, and while lost in speculations on the infinitude of God's creative power almost forgot that they were men. But in our own time the microscope has taught us that evidence of a power not less wonderful abound in every atom of our globe.

The one teaches us that the earth and all it contains is but a cell in the vast circulation of the universe; the other that the air we breathe is filled with it a thousand animated forms; that...
"When the poet
stands mantled red with green, invisible
amid the floating venom millions stray." —
and we learn that there is nothing small in nature.
the one makes us tremble at man's insignificance,
and human intelligence seems unequal to grasp with
truths so complex and infinite; — the other brings
us to the commencement of the theory of organization,
and we behold the same laws which keep the planets
in their course regulating the movements of a
microscopic cell. For the simple cell is a type
of the whole vegetable and animal kingdoms; and
in its functions of assimilation and growth, in its
reproductive powers, and final death, we have before us
a miniature example of what takes place in all
organisms, however complicated they may appear.
As familiar examples of the importance of the
class of parasitic fungi, we may enumerate some of
the diseases to which the order Graminea is liable.
How often do the promised harvests of our fields
Fig. 1. Portion of straw attacked by Meineia truncata (Dipt.).
Fig. 2. Spores of Uredo vesticulae magnified 325 diameters.
Fig. 3. Group of the spores of U. fruticola with the measles.
This is interesting as being one of the supposed cholera funes.
droop beneath corrosive blights? To the common observer these appear disgusting and shapeless, and the farmers invest them with unwholesome names, without suspending their true nature. But the microscope reveals their wonderful organization, and their varied and often fantastic forms. To this class belongs the dreaded "wilt," caused by the Precirca sparsinys; it attacks the stem, leaves, flowers, by appropriating the nutriment of the embryo, leaves it chlorotic deficient in blight. This tells us that he calculated in one plant ten millions of spores, and they are so infinitely minute that they arise like thin smoke into the air by evaporation, we wonder therefore that under favorable circumstances they should cause such extensive damage to the farmer.

The Musco segetum (ermut), U. farida,托福. Attack the flowers, convert the young embryo into an abortive mass. Another of this class the penicillum glaucum is a well known but not very welcome visitor; it finds its way into the housekeeper's jar of preserves, invades among old books, and shows a partiality for science by
Visiting the collections of the Naturalist's Repository.

Merulinus ventralis, Phleumymalis, cause the "dry rot" in wood, often destroying in a short time massive beams which it had taken a century to mature.

But the importance sometimes distorted by these tiny despoilers cannot be better illustrated than by stating that the potato disease which so lately spread famine and pestilence through the land, was caused by a fungus, the Sclerotium solani, a striking comment on the words of Thomson: "A pestle cure, yet 244

The sacred cords of vengeance, on whose course
Consorts famine waiteth, and kills the year."

I might multiply instances innumerable to show the importance of this order, but the above taken from the vegetable world are sufficient, and in future pages I shall have occasion to mention the diseases they produce in the lower animals, more especially their occurrence on the human body, and the pathological changes they give rise to.
(2) Philosophical Transactions, 1764 (Hill & Neumann).
(3) Wiedberg (Ve de Animalculis infusorios naturae), p. 31, fig. 249.


(5) Heften zur Morphologie, t., p. 192.

(6) Archives de Wiesmann, 1835, p. 354.
History of the Vegetations found on Man and Animals.

The annals of antiquity furnish nothing on this subject, indeed with the exception of a few imperfect notices scattered through various journals, the history of vegetable parasites belongs to our own time.

Although this Paper only professes to treat of those found on Man, I have thought it better to add also a short Bibliographical account of the several species occurring in animals.

(1) Paracini as Reamni (1726), first record instances of fungi developed on insects during hibernation; (2) Still with (1764) on Ephesia found on Larvae at Martinique.

(3) Lederer (1763), Newman (1764), Vosberg (1765), V. Wallengren (1769), noticed the occurrence of vegetations on the dead bodies of insects placed in water. Subsequently Muller,

(4) Nees at Eisenbeck, (5) Bärtel, and others, observed Achlya proliferans on dead flies. (6) Meyer (1835) says he has seen the fungus common on flies in Autumn, produced by sporules which were in water. This proved to be the Achlya proliferans. Kirby & Spence (1828) give
Appearance of the Muscardine (Botrytis Bessianae).

1. Superficial fat-cells of the caterpillar, among which it takes root. 1-43, fantastic appearance of this ento-phyte and its spores.

2. Bassi, Del mal del regno, calcinario, s muscardino. Milan 1835.


Spiraemum q. Dysticus, observed by conjoined growths.


5. Observations on parasitical growths on living animals. By G. Back.

(Microscopic Journal, 1841.)
descriptions of several fungi found on living insects.

(1) In 1835 M. Baséi proves that the disease called Muscardine which produces great fatality among silkworms was of vegetable origin. The labours of Babcock, Montague and Antonini complete the history of this disease. Doutrelet gives an account of works published on the Muscardine in the Annales des Sciences Naturelles 1838.

(2) Westwood (1841), exhibited at the Entomological Society of London dried specimens of Chinese larvae, from the back of the neck of each grew a slender fungus (Pharia sinensis) about twice as long as the insect; this constituted a celebrated Chinese drug. (4) M. Cordey gives a figure of Penicillum Tubcrii growing on Phialastra praemia.

(5) Buck has been conferring communication to Dpticus marginalis and causing its death. It was kept in a vessel with Valetiemia miralis on which the confeces grew. Various species of Gharina attack the insects, mostly in the larva state. S. Robertson is developed on the larva of Hepialus vineaeens in New Zealand, when it becomes affected it buries itself in the ground, and the interior of its body is filled with spores, one of these
The Dana of Hepialus virescens attacked by Sphacria.


(1) Harnosek (Archiv f"ur Natur- und Phys. 1859); and Valentins Repertorium, 1860.


Confusia developed on the scales of byprinus aurantius.

SeeKenneth in Trans. of the Royal Society of Ed. 1842.

springs out behind its neck, and forms a long, slender fungus.
Spharia Taylori is found on an Australian caterpillar, and
S. vitiosporus in wasps at Guadaloupe.

Passing from insects we find Cano (1843) giving a de-
tails account of disease produced in young salamanders by
Archyia pellucida. (1) Hammond (1840) found the same plant on
Arion punctatus, and succeeded in transferring it to frogs.
Still more, though first deprived of this fungus, marmosets
were similarly affected. (2)

Lamart (3) and Valentin found certain fungi destroying the rose of
arthropods and fish. (3) Schmiedere, notices Nemera meteorica on the
leaves of Salmo aphodius. Long before this Plenman (4) and
conference growing in the Rhone; and Böckh (1832) on the carp.

Mr. I. Cooper, Lordine, and Bennett, (1842) notice this conference,
causings the death of gold fish (Cyprinus auratus); and Muller and
Paraques directed a bird's eye with a slender tail, known to the
fisherman as unfit for food, in the air, but of which they
conference confer. (Muller's Archiv. 1842)

Among plants several instances of parasitic vegetation are
recorded. (5) Macqu (1815) found mould in the air cells of a jack-daw.

(2) 

(3) Fungi occurring in the lungs of the river duck.

(4) See, Annales des Sciences naturelles, 1841.


Eumycetes of the genus Aspergillus (Murr.) found in the lungs of Atryp Dyschena.

Dactylum rogenum.
Jaque (1816) others in the air-cells of a Swan. But none of the cases hitherto given appear to have excited much interest until Mr. Owen† in 1832, states before the Zoological Society of London, that he had found patches of greenish mould or mucor lining tuberculous cavities in the lungs of flamingos. "I concluded," he says, "that internal parasites are not derived exclusively from the animal kingdom, but that there are autophytes as well as hetero..."

† DeLongchamps records similar growths in an Eider duck (Ana, melissina) whose heart, had been long affected. ‡ Muller & Retzig found, monograph-like bodies of the genus Aspergillus in the lungs of Strix nyctea, and talaus rufus, both were affected with tuberculosis. (*) Roux and Hermann a different kind of mould as not infrequent in sick pigeons \\

Rayer & Montague denounced a very beautiful vegetation (Dactylinum oogenum in hen's eggs which had been long kept, most probably undergone partial decomposition. (Archiv. de medicine comparée. p. 59. 1843.)
* Tronchet's M. Notizen 1841. See also Hebe Pathologische Untersuchungen 1840. + Comptes Rendus 1841

§ Vp. Cit.

(*) Deseser, Annal. physi. medic. Kiel. 23, 8743
Ht. Lange in 1666 bonenrec records a case of this kind in the Miscellanea.

Merlinie, writ by J. M. Cstrimie, Lipiseck.

# Repertorium of Valentin 1840. + Tronchet's Neue Notizen 1839.
# Muller's Archiv 1839. + Medicinische Zeitung 1840.
The only cases of Intestines occurring on Mammalia,
(with the exception of man,) which I find recorded are the
following; * Langenbeck states, that conceive abundant in
the mucus of wounded horses, and Vogel and Henle say this
is not a constant appearance. * Rousseau. * Lermorin mention
having seen vegetable mounds in Carnus aries, * Lechat's India;
and Bennett an erupturn like warts on the nose. *

Lastly on Parasitic fungus found on Man we have the
following observations. * Degeim, quoted by Haunser, was
the first to observe vegetations in a case of gangrene.
Horn (1759) reports a similar case when a
whitish green mound appeared several days before death;
also of vegetations attacking higher surfaces. * Dewe & Mcll
Haunser (1826) gives detailed cases of the same kind.

* Langenbeck (1839) found vegetations on the tonsils, Mphany
of a man who died of Typhus. * Schaeuken the same year in-
icated the presence of fungus in the crust of Guinea favora,
although Rempe (1830) has noticed them in 1836. * Godby (1831)
gives a much more detailed account of this plant, see also F.H.
* Muller's Archiv. 1842. p. 294
Lyndy (1842) discovered a new plant (the *Sarcena Pentriadi*) in fluid vomited by a patient at regular intervals. It has since been observed by Busk, Schlesseberg, and others.

Lyndy found a species of contagious mastaga attacking the roots of the beard. *Jahn* reports various cases of similar occurrence in the sephannah, *Langenbeck* similar growths in what he calls acerulous disease of the skin; *Bennett* vegetations on the lungs of phthisical patients; in the mouth of a man affected with pneumonia; on the gums and teeth of typhoid patients.

*Berg* (1842) communicated to the Medical Society of Stockholm the vegetable nature of the Afflochae of infants, like observations were made about the same time by Tooght 

In (1843) Lyndy announced *Erotes* decalvans to be caused by the growth of fungi, and in the following year Lyndy and *Melstrom* found similar growths in Helix lusoria (segenare) and *Gummbing* in hair attacked by *Phial in Polonica*.

Subsequently various cases have been recorded which will be given in the descriptive part of this work.

See also, *Robin*, "Des Vegetaux qui croissant Sur l'homme..." (1847).
† See Thracian Life of Epicurus.
On the Equivalent Generation of Parasites.

How do these creatures originate? This is a question which has puzzled many and observant. According to the best philosophers of our day, they are propagated by spores, germs, or ova. Facts constantly increasing in number make this view of the subject more probable and consistent with the known laws of development. It is not to be wondered, however, considering the infinite minuteness of the germ from which many plants and animals originate—considering, that we are unable to distinguish at certain periods, even with the most powerful microscope, the germ—mind cell of one animal from that of another, nor these again from the spores of many plants; and the history of generation should be surrounded with much mystery.

The ancients traced the origin of all things to prime.

primeval generation. According to Pythagoras, the primitive earth was flat and narrow; and the sun, gradually warming it, soon covered it with vegetation and animals; there also began to arise on the surface of the ground a great number of small parasites like mushrooms, which...
* Aistet. de Part. Animal.

† Notes to Bostock's Anatomy of Melancholy. 6th ed. p. 325.

‡ Gerard's Herbal or General History of Plants. 1597.
having in a certain time come to maturity, the
skin burst and then came forth little animals, which
ggradually retiring from the place where they were pro-
duced, began to acquire... Aristotle* the greatest of
ancient naturalists believed this origin common, even
among some of the vertebrate animals. During the
dark ages little advance was made upon the old fable-
tories of development; and the origin of reptiles and
serpents from mud; of marsupials from putrid flesh; of
insects and beetles from dung, flies from putrid urine;
and a number of equally absurd stories received im-
plicit credit. Cornelius Gemma(+) believed that the immense
swarms of locusts, which infest certain lands, were con-
ceived by celestial influences; Boethius and others that they
are "raised by the illusions of spirits, which are princes of
the air." Gerarde* recounts many extraordinary facts of
this kind. "There are found," says he, "in the north parts
of Scotland and the islands adjacent called Orkudes certain
trees, wherein to grow certain shells, of a white color;
tending to resemble, wherein are contained little living
Pagination is inaccurate in original volume
I find the following fanciful notice on the production of heles, in Harrell's History of British Fishes. Vol. I. p. 189.

'Aristotle believed that they sprang from the mud; Pliny from fragments which were separated from their bodies by rubbing against rocks; others supposed that they proceeded from the carcasses of animals; Helmont believed that they came from May-dew, and might be obtained by the following process: 'Cut up two turfs covered with May-dew, and lay one upon the other, the grassy sides inwards, and thus expose them to the heat of the sun; in a few hours there will spring from them an infinite quantity of heles.' The fishermen about the rivers of Limerick believe even now they may be produced in any quantity by placing the hair from a horse's tail in water; and strange to say, the farmers then suppose the wire-worm to have a like origin.

It were easy to multiply instances of this kind without spoiling so far back as the days of Theocritus, or recurring to "The Metamorphoses" of Ovid.
creatures, which falling into the water, so become fowls, which we call Barnacles. And this is believed by the fishermen on these coasts to the present day. So also the generation of Sponges was attributed to a putrefaction of the sea's sewer, or its spontaneous productions. Besides remarks of these: "There is found growing upon the rocks near unto the sea, a certaine matter wrought together of the fume of both the sea, which we call Sponges."

The above extract will show that the doctrines recently put forth by Lamarck and others are anything but original. We are inclined to smile at the ignorance of our progenitors, but let us remember that while every instance recorded by old writers in favour of spontaneous generation has been disproved, this theory has been revived of late to account for the origin of a class of beings of which the ancients knew nothing. Happily for the credit of the 19th century it has found few supporters among men of science. Indeed the researches of Schwann, the Lysons, Thuetz, Huxley, Owen, and many other illustrious men,
have proved that the lowest orders of inorganic animal - 
eness, & the microscopic confuses hundreds of which crowd 
a drop of water, follow the same laws of cell development, 
live their short life, reproduce their kind, then die, 
like the lower bulky plants and animals which populate the 
earth.

The arguments in favor of spontaneous generation 
are briefly these - There was a time when all things 
now existing must have had a beginning, that is to 
say, arisen without parents. Geology points out that 
in the various phases through which the earth has 
passed, succeeding dynasties of animals and plants: 
differing from those now extant, have flourished on it 
and become extinct, leaving nothing but their remains. 
Like remnants to tell of the past. If this be true, 
why should not existing organisms which at a prime 
period originated spontaneously and have subsequently pro-
propagated themselves in a different way again arise 
spontaneously? Or supposing that new physical conditions 
prevail on the surface of the earth, why should we not
have new modifications of being, to meet such changes?

Of the origin of things we know nothing, but what the

Old Testament reveals to us, for the endless theories upon

this subject advocated by ancient and modern writers leave

us as much in the dark as ever. I shall therefore confine

myself to the consideration of facts, brought forward in

support of eugenic generation.

The Chemist has discovered that the materials from which

organic bodies are formed, are identical with those existing

in the inorganic world. He has also been enabled by

patient research to determine the proportions in which

certain elements such as oxygen, nitrogen, hydrogen, carbon,

unite to form various organic compounds. Furthermore,

he has already formed artificially several of these, such

as urea, adrenin, & some of the vegetable alkaloids;

although he has found these are products of digestion and

distillation, thrown off from the laboratory of nature,

not such as she employs to build up and nourish the

tissues. Still why may he not in time succeed in

manufacturing fibrin or albumen? Here he pauses, and
Pagination is inaccurate in original volume
* Archerson in Mullen's Archives. 1840.

here let us part with him until his work is accomplished.

The Physiologist informs us the fundamental type of
being is the nucleated cell capable of reproducing itself,
and that all organisms however complicated they may appear,
arise from this apparently simple source.

"Give me a vesicle," said Raspail, "and I will make a man." According to M. d'Arcy (*), who was in advance of the chemist
inasmuch as the products of organization were at his disposal,
discovered that by the mere contact of oil and albumen
a delicate membrane was formed very like other homogeneously
membranes; and that by distilling the two
一起去，一整列的溶泄毛细管小体便被
produced with delicate albuminous envelopes, which under
the microscope might readily be mistaken for this kind of
cells. Dutrochet subsequently gave out that globules
could be produced in albumen by electricity; and Leibig(†)
that they were formed in any albuminous fluid, which
had been neutralised by an acid — "here, my sons," are
great facts. all we require now is to discover that
new abstraction — that property of matter called life,
to make these grow, and transmit their kind, and form an organism. Has it never occurred to such speculators that in like manner a Phidias can take a block of marble, and strike therefrom an image of the most perfect human form, a Venus, or an Apollo, and that his expectations of these growing into life would be quite as rational? I have no desire to enter into any

definition of what the vital force is. Chemical and

physical laws are certainly not sufficient to account

for the phenomena of life, as far as we yet know them.

Physical forces undoubtedly act on, and react upon the

vital force, and in like manner the presence of life

modifies and controls their action. Hippocrates, although

his physiology was enmeshed with Pythagorean theories

recognized a vital principle, which he calls **pòros**, not as a self-acting but controlling power, regulating the actions excited by extraneous causes. And it is much
to be regretted that Paracelsus, Descartes, and Stahl, while

breaking up the splendid dreams of antiquity, should have thrown

aside at the same time so much which we now recognize as true and just.
* Vestiges of the Natural History of Creation. 1844.
Commenting on the discovery of Albrect: a celebrated modern writer remarks: "If therefore these globules be identical with the cells which are now held to be reproductive, it might be said that the production of albumen by artificial means is the only process wanting. This has not yet been effected, but it is known to be only a chemical process, the mode of which may be any day discovered in the laboratory." But without further investigation, he constructs an hypothesis of generation, nutrition, and growth upon this globular foundation, from which the "breath of Sir Isaac Newton" as hypotheses and metaphysics, as physics, as qualitative occultism, and mechanism in philosophy remain non habent. The rest of these globules is instructive; they were truly found to be reproductive globules, but owing like those recorded by Leibig, not to vitality but degeneration of albumen, they were in fact donor in the presence of vegetable of low type, (the T. tubera albuminis?) such as we find in any decomposing organic solution.

But the triumphant fact brought forward in proof
of Spontaneous Generation is founded on the experiments of Crosse
and Wekesa. Mr. Crosse, while experimenting on crystallization,
caused a powerful electric current to pass through a solution
of Silicate of Potash, when he first observed the little creature
which in honour of its discovery, was named the Aedes Livens.
He next treated in like manner a solution of Nitrate of Ammonia,
and in due time the A. Cricci again came forth. Subsequently
Mr. Whisker of Sandwich repeated the experiments taking every
precaution to prevent the entrance of germs from without. He first
tried the Silicate of Potash & observed after a time a quantity of
gelatinous matter around the negative pole of the Battery. "A
part of the process," (remarks the author of the Vestiges) "of considerable
importance, considering that gelatin is one of the propinquitous
principles of first compounds of which animal bodies are formed."
But surely the decomposition of a part of the fluid & precipitation
of siliceous with gelatinous the appearance as well, and there is no
very striking analogy between it and gelatin. The result of
the experiment was that the insect again came forth. Solutions
of a different nature were then tried with like success. Lastly
Mr. Whisker joined the galvanic current through a solution of the
Footprints of the Creator: a work which all should use.
The purest form of potash, surely conjecturing, that this substance contained more carbon than any of the forms, accordingly in still greater numbers than were the terms expressed crudely forth. Of course these facts gave rise to considerable discussion. Specimens were sent to the Paris Academy, and the philosophers there were quite staggered that electro-generated insects should contain even within them. Again it was against all experience that one animal could be formed from such heterogeneous compounds. Suppose a man were to exhibit specimens of bread, said to have been formed by passing galvanic currents through various solutions, say the first was of nitrate of silver, and the product bread, and the second of Sulphate of Magnesia, and the product still bread, and lastly, the experimenters fuming, there was more carbon in chalk, were to try that, and with the production of still greater quantities of bread! Extravagant as the idea is there is no doubt he would find numerous disciples to put faith in him, for as John Milton well observes - "There is a species of superstition which inclines men to take on trust whatever assumes the name of science; and which seems to be a reaction on the old superstition, that has faith in witches, but none in Sir Isaac
* See Mr. Newman in the Zoologist, 1815. Edinburgh Review, No. CLXX.
Newton, and believed in ghosts but failed to credit the Lapridian Calabares.

The future history of this insect is also instructive. Thousands of the same species were found in all parts of the kingdom, in dirty rubbish, among the bottles, and debris of laboratories, in dust-Cabinets, among its books. And the fact soon transpired that it was no new species at all, but one of the most plentiful of its tribe, a little binchy monster, which for its peculiar ugliness had been named the Arabus horribilis.**

How it found its way into the laboratory experiments with which I do not attempt to explain. But a reflecting mind looking for a cause for every effect, will pause long before admitting that an insect of high organization could be formed from such diverse materials. We know that beasts exhibit wonderful tenacity of life, bearing extremes of heat and cold, and resisting almost every effort to destroy them. We know moreover that their minute brain still more had to kill than the animals themselves, and find entrance into the most unlikely places. So that many a one besides his wishes has been inclined to ascribe their origin to spontaneous generation.
The electric force has of late been invested with almost
creative power. "Organism", says Klein*, is galvanism
receding in a perfectly homogenous mass. "Air, water, earth, ex-
isting as a saline medium, art galvanism as a vitalizing prin-
ciple, are the basis of all organized beings": the Adox Diano
argue some is like a tree, and in produced by galvanism. Why
may not real trees be produced by it also? Others have
attempted to prove the identity of the galvanic and vital
forces, but all such theories have hitherto proved abortive.

It appears to me that as far from galvanism I electricity
being formative agents they are the antagonists of organization,
as far from building up they destroy. We see how the
one decomposes all chemical mixtures, splitting the simple from
the compound; disturbing the attractions which bind
particles together. We see in the great laboratory of nature
how the other blunt instead of forming life, dissolving, organized
substances into their original elements, and dooms them to
premature decay. Where on the other hand, came in the
dreams of philosophers, have we permanent instances of
their vivifying powers? An artistic design?
A Disquisition on Pestilential Cholera &c. By C. Cowell M.B.
London 1848. 8vo.
fungi, as is well known are frequently termed “sweeping up after storms, or in particular states of the atmosphere.” But this is no proof that they are generated by electricity, any more than that they fall from the clouds. We know that after a thunder storm fermenting fluids such as alkaline crenacous, and fern. acis, milk also partakes of a similar change, and probably many other animal and vegetable substances which escape our notice. How fungi require for their development a matrix of some organic substance in a state of change, and what is incorrectly called the acetous fermentation is especially suited for such development. This is exactly the state of things we find after a thunder storm, what more therefore is needed, but that some of the immaterial sprits pervading the atmosphere, descending with the rain — those “seamings of nature” ever active and watchful, should seize at once and claim such products as their own? Surely this is a more simple and rational interpretation of the facts of the case, than to call in a new and little known agent, and invest it with powers which belong, only to the Creator. D. Cordell (**) also suggest that the
electric force may act under these circumstances by merely fitting the spores mechanically, in the same way that we know certain powders adhere to lines traced by a vacuum on wood, while from other facts they are at once blown away.

I shall next consider the arguments advanced in favour of the spontaneous origin of infusoria, moulds, and the like.

Pristely first observed that the green motes formed in organic solutions, when exposed to light and air, consisted originally of a mass of moving particles which he called animadules, and that subsequently these were resolved into globules which by elongation and division formed confluence, or into infusoria. Hence he supposed the moving particles first observed were common to animals and vegetables.

Ingenhousz likewise supported this theory. But we now know that the spores of many cryptogamic plants present the phenomena of motion in a remarkable degree, and that there has been too much tendency at all times to associate the mere fact of motion with animal life.

Klotzing and Bory de St-Vincent prove that in Ullothrix zones there are active cells furnished with a red spot, like
Spores furnished with siliceous capsules. 1. Cuprea.

* Track of the Nature of Animals Vegetable. 9th 1799 (1820).

the so called eye of Thunberg's green nudibranch and these afterwards elongate into undoubted vegetable filaments, still however retaining this red spot, probably the nuclei of the cells. Many of the coelentera are furnished with ciliing processes which enable them to move through fluids until they find the suitable conditions for growth; these disappear after examination. The Diatomacea and several allied genera are now admitted to belong to the vegetable kingdom, and many varieties figured by Thunberg, as infusoria, even Zoophyta and its allies, there is small doubt will be removed to the same division.

It cannot be enquiring therefore that the spores of plants should give rise to plants.

The question of their origin may be thus stated. Schmidtian proved that no animals or vegetations are formed in infusions from which the atmosphere is excluded, as by covering them with oil, or hermetically sealing the vessel. The experiments of Schwann, Helmholtz, and Dr. Marklein, have abundantly proved that under circumstances otherwise favourable for the growth of these being none appear; when the possibility of the transformation opening and opening is precluded.
* This experiment is given in the Edinburgh New Philosphical Journal. MXXIII. p. 165.
The supports of spontaneous generation object to the experiment of Spallanzani, that no animals, indeed, appears, *merely because the exclusion of air has the effect of preventing that species of decomposition which they require as necessary for the formation of the impurity*. Professor Schnilte of Berlin set the matter at rest by an ingenious experiment. He filled a glass flask half full of distilled water, in which were various organic substances: this was made air tight by a stopper through which passed two glass tubes bent at right angles. It was now heated until the water boiled violently, while the steam was escaping from the two tubes, one was placed in a vessel containing concentrated sulphuric acid, the other in one holding a solution of potash. The apparatus was then exposed to summer light and heat, and the air renewed in the apparatus several times a day by the experimenters sucking the tube placed in the solution of potash. From the 28th of May to the end of July this was continued, and although portions from the edge of the liquid were examined almost daily, not a vestige of any living animal or vegetable substance appeared. Another vessel also exposed to a boiling temperature, it containing the same ingredients but
- Embryology of the Vertebrates
left them, was placed by its side; and in this next day
the Professor found Vorticelles, and Monads, which were soon en-
seized by large Polyzoa, and Infusoria, and Rotifers. I
repeated this experiment in the autumn of 1850, and with
like results. Surely this proves that something more than
changes of composition of the organic molecules in the infusions
in whatever way induced, are the sole causes of their formation.

Nor on the other arguments adduced by Dr. Allen Thompson and
others more conclusive. That the nature of the animals of
vegetable production bears a constant relation to the state
of the infusion, so that, in similar circumstances, the same
are always produced without this being influenced by the atmosphere,
is not wonderful when we remember the tenacity with which
species associate themselves with certain kinds of soil, although we
cannot explain how it is anymore than that certain animals
and vegetables inhabit different countries and climates.

Again, that we should find "a certain progressive advance
in the protective power of the infusion," for at first the
animals are only of the smallest kinds of Monads, and after-
wards they become larger and more complicated in their structure;
"For Nature... as Aristotle has written, passes continuously from thing without life to animals, through things which live yet are not animals..."  

(*) "Lectures on Comparative Anatomy" by Prof. Owen. 1843. p. 27.
is not more wonderful, for we know that while the lowest classes
of animals feed upon organic particles which were heretofore,
to decay, they in turn enter and become the prey of the higher
classes of their own kind, such as Polygastric animals, etc., etc.;
these of the small animals, which in this form are devoured by
larger animals, higher and thus a vegetation, fit for the nourishment
of the highest organic being, is brought back by a chain route
from the extremity of the realm of organic matter. (*)

The above remarks apply equally to the subject
of vegetable parasites. In all cases, when they have
yet been found, they have been associated with either
a general or local deterioration of the fluids or solids
of the animal attacked. And if we allow them to
be derived in some instances from the atmosphere, as
well as by direct contact or inoculation, we are enabled
to explain every case of the kind yet recorded. For
hitherto antrophites have only been observed on free
surfaces, accessible to the atmosphere, such as on the
skin, mucous membranes, and in the respiratory apparatus,
of the various classes of animals.
* For further information on the subject of this chapter, see Young's Pathological Anatomy. Owen's Lectures on Comparative Anatomy. And the learned work of J. D. Heinrich, die Lehre von der Ursprünge, Halle 1804. Also Redi's De Generatione Insectorum. Amst. 1668.

† Some skepticism may be natural and reasonable when speaking of organisms 1/1000th as large in length, still we think it strange that one who argues as well upon the errors of others, on this very subject, should have made himself liable to a like charge. "At one time, he observe," it was a common belief among scientific men as well as the vulgar that many animals might be produced by spontaneous generation, as for example, the numerous insects or their larvae infecting putrid substances, various kinds of worms (Annelida), and molluscan animals, as well as even some fishes and reptiles; but the increased knowledge of the structure and habits of these animals, and in particular the observations of Redi and others, demonstrates the error of this opinion, and shows it to have arisen merely from the circumstances of their real mode of development, not having been observed. See, ed. of R. Thompson.
The limits of this paper will not allow me to discuss the subject of the formation, all allow it presents difficulties; but the arguments advanced to account for the presence of one class, also apply to the other. *

We conclude therefore:

1st. That as the theory of evolution has advanced, the number of those animals supposed to arise spontaneously has, in like ratio diminished, so that those instances recorded by the earlier writers in favour of this view, are now known to be generated by propagation alone. +

2nd. That in all cases where opportunity has been afforded, for tracing, by direct observation, the origin of an organism, it has taken place by propagation; whilst, on the contrary, not a solitary unexceptionable observation of a spontaneous origin exists in the records of natural history. Analogy, therefore, is completely in our favour.

3rd. That he who argues that any animal or plant arises spontaneously, merely because we have as yet been unable to trace its mode of development, "he that can set up a hypothetical possibility against acknowledged certainty," is not
Fig. 1. Mucoid deposit, from which P.P. Bennett observed fungi to arise in a patient suffering from pneumonia thorax.

Fig. 2. On the right are spores belonging to the above; those on the left are the spores of Torula cerevisiae.

Microscopic appearances.
to be admitted among reasonable beings.” (Johnson).

4th. That unjustified by analogy in stating, that


terophytes, like other plants, are derived from eggs or spores.

5th. That there may be communication by direct contact,


or under peculiar circumstances, from eggs floating in

the atmosphere.

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**Botanical Relations of the Entrophytes.**

All the Entrophytes yet known are cryptogamic plants,

belonging to the lowest divisions of Fungi and Algea.

Those found on man are exceedingly minute, and exhibit

under a magnifying power of 300 to 500 diameters, the

following elementary forms, variously arranged:

1. A molecular blastema, composed of minute granules,

forming a soil from which the plants arise. (fig. 1).

2. Round, oval, or square cells or vesicles, arranged in

twos or threes, or separate, containing the whole plant, or its

spores, as in Sarcina and Torula. (Spore). (fig. 2).

3. Fibres of various lengths, with or without divisions or

constrictions, or variously branched. (Thallus fibrilis). (fig. 3).
(Fig 4)

Shell of Taurus enclosing several spirules.

4. Filaments containing spores (Sporangium, ferns, mycelia).

Some writers have denied the vegetable nature of these growths. I believe them merely to be modifications of the ordinary cells of the body. In answer to this we state:—

"No constituent tissue of the human body, normal or abnormal, at all resembles so closely in all their stages of development".

2. The fisciparous division of cells, the elongation of their into tubes bearing various branches, often divided by transverse septa, the simultaneous development of sporangia distinguish them in like manner from animal cells; and their analogy in the former case to the family Conio-mycetes, to which belong the tinder; and the latter to the Hypho-mycetes, examples of which are found in various moulds.

3. These growths are known to develop themselves under suitable circumstances altogether apart from the tissues of the body. 4. Parts of various cylinders, when dried and pulverised, have been known to germinate again when placed in suitable menstrua; and this alone would distinguish them from the cells of the human body."
Diagram illustrating the sexes of development of Fungi.

1. Spores of Fungi which Remak introduced into the end surface of an apple, after three days.
2. Four-fold division of the Larva (Vermiculi).
3. Portion of the front cope of the algae, showing the similarity of division with the last.
The modes of development found in these minute organisms are similar to those in other cryptogamous.

The most common way is by the fissionous or meristic division of a cell into two or more parts; or they may increase intrinsically by the setting free of some formed within a parent cell. Frequently we find a cell put forth one or more buds, which elongate into filaments, and after a time spores are formed in the extremities of these.

According to Mitch Henfrey the first process commences by a doubling inward of the inner membrane of a cell, which detaches itself from the outer or proper cell wall, it forms a constriction, which deepens until the original cell cavity is divided into two compartments. Sometimes, as in Eucamea, the nucleus of the cell divides into four portions.

This mode of development may be compared to the growth of cells in a flowering plant, which are at first alike but after- wards assume various forms, until the plant is fully evolved; even then it may reproduce new individuals by the process of budding. But there appears to be a limit to this mode of increase. Accordingly we find new vitality infused into
the species by the union of two cells, the pollen grain, and the 

germinal vesicle of the ovule, a new cell is thus formed and 
the process of growth recommences at first.

In the simplest forms of vegetation the same law seems to 
hold, that the first cell gives birth to many others like 
itself, capable of separate existence, and each performing 
the functions of stem, root, flowers in the flowering plant.

But according to the observations of Raffles and Drachter, it 
the case would degenerate and run out in time if nothing 
but fissional reproduction existed. Accordingly, it has 
been proved recently that not only in Conjugatae, but also 
in Algae, Classidea, and Palmella, a process analogous 
to fertilisation in the higher plants holds good. This takes 
place also by union of the contents of two cells, the endosperms 
merge, as in Conjugatae passing into the cavity of the cell; 
or sometimes both cells pass into a common receptacle, and 
form by such union a spermatium containing spores, which 
are equivalent to the seeds of plants; so it is believed that 
fertilisation may occur by the partition between two cells in 
the same filament breaking down, scattering their contents to wind.

(4) Belfour Botany
Speaking of this double mode of reproduction in the Entomobryae, Professor Ovenden makes the following observation: "I am apt to think that the fisciuous reproduction has reference principally to increasing the number of individuals in the infusions, or receptacles, of living organisms, in which they at that time exist, whilst the development of fertile spores relates to future and different localities, or collections of such infusions, into which the spores may be conveyed more easily than the living animals." Such also may be nature's meaning with regard to fungi, so that when the medium in which they have grown is dried up or exhausted, their infinitely minute spores may be raised by the wind, suspended in the air or water, ready by their tenacity of life to vegetate again wherever they find the necessary conditions for their growth. The vital filaments attached to some of these spores seem to have a like reference. Some of the fungi increase with amazing rapidity. The most noticed Phallus infundibulum shoots up three inches in a quarter of an hour, I attain its full size from inches and a half in an hour and a half." Jennifer states that he has known Brassica gigantea grow in a single night from...
the size of a mere point to that of a huge gaud. Smaller instances may be seen in the rapid multiplication of cormals in aqueous solutions, and the blight of wheat, &c., caused by fungi.

Their office is to prevent the accumulation of decaying organic matter upon the surface of the earth, and thus free it from many noxious substances which must otherwise prove detrimental to its inhabitants. But they share with the Enzymes another and still more important task, by leaving upon and fixing during their transit substances which must otherwise disintegrate and return to the inorganic world. Having thus carried them back into the ascending stream of life, and converted the decomposing particles into their own tissues, they in turn become the prey of minute animals, and so on to the highest forms of life. They thus perform by a shorter process the functions of more perfect plants. The one receiving organic substances from death, the other elaborating from the inorganic world new elements requisite for the food of animals.

I shall defer the few remarks I have to make upon the classification of Entophytes until the desultory portion of this paper.
Pathological Relations of Entophytes.

The whole class of fungi differ widely in many respects from most perfect plants. The latter draw their nourishment from the atmosphere, from salts found in the water and soil which they inhabit. The former, as we have seen, require for their development the presence of some organic matter in a state of fermentation, or decification, or putrefaction. As a result of such food, they lose many of the more marked characteristics of plants, and seem by their form and color, their excretions and chemical composition, to assimilate more closely to the animal type, for which indeed they are frequently mistaken. This is especially the case with entophytes, which seem to form the connecting link between these two great organic kingdoms, and partake somewhat of the characteristics of both. From what we know of their habits, therefore, we should not expect to find them attacking the fluids or solids of the healthy body, and it will be found by reference to the cases recorded that such is the fact.

The question therefore naturally arises: what is

the particular state of the system which renders it liable to these attacks?

Professor Bennett, in his masterly paper on parasitic growths attacking man and animals, arrived at the following conclusions: 1st. That these vegetations always arise in living animals previously diseased; 2nd. That their presence indicates great depression of the vital powers and impairment of the nutritive functions of the economy; 3rd. That the peculiar constitution of cachexia favourable to their growth in the tubercular or tergalous in the mammalia, birds, and fishes, most probably in reptiles, and insects. Subsequently he states that such vegetations in all cases arise from an albuminous exudation allied to tubercle.

This is undoubtedly true as far as the most important of these growths, such as those occurring in tumors, various serpulous ulcers of the skin, and Rhizopus, &c.; and with this author, Richardson, Burges, Helman, Malton, Bright, and others, I should consider their presence pathognomonic of the serpulous diathesis. But occasionally, we find entrophics present in bodies otherwise healthy, or any one.
Gazette Meriche. 1843.
unconnected with tubercle, and dependent on local causes. The presence of phosphenes, and even recorded by Meyer, Wilhelm, Dare, and Bythoan, are of this description.

That such appearances should not be unexpected, cannot be surprising, when we consider the following facts.

Letting in 1843 states that he has succeeded in precipitating albumen in the form of globules by adding water and acid to serum. M. Andral and Garanet, repeated his experiments, and found that such globules were formed in any albuminous solution, which had been first neutralised by an acid, such as the white lime, by various moist bloods, the serum of pernicious matter, etc. These globules consist of a number round or oval vesicles, like those observed in solutions of fermentation. These vesicles first appear on the surface of the fluid, and soon began to put forth buds, and these lengthened into stems, which gave out branches, which in turn produced smaller ones to an almost indefinite increase. Or several vesicles joined at the roots, which by elongation formed moniliform stems. Like experiments have been since instituted on the milk of various animals, with like results.
It would therefore appear, that it is only necessary to render the albuminous fluids of the body acid, in order to make them a fit soil for parasitic vegetation.

According to this theory we should expect to find them on the surface of foul ulcers, in case of pernicious where the venoms are intense and aid, in persons affected with phthisis where in like manner a state of acidity prevails throughout the body, and also in typhoid patients. This also will account for the Measles occurring so frequently in foundling hospitals, and in those where number of infants are reared, where cleanliness is little attended to, and the digestive organs are often out of order, favouring the acid reaction, and where the germs of the parasitic are communicated by the means from one child to another.

It is well known that vegetations similar to those found in the lungs are common on the teeth and gums of persons suffering from indigestion. In all cases when the tongue has been found the fluids vomited have been in a state of ferment and given the acid reaction.

It has been further proved that the presence of such
growth has had the effect of approximating and perpetuating such a state in the parts they attack so as is favourable for their development.

**Diagnostic value of Entophyta.** That this presence indicates a decapitated or echaotic state of the system in many cases, have already shown. But a question of great importance now arises. Are peculiar vegetative pathomorphisms certain diseases? Rippe details certain experiments in which he thinks he has traced the identity of the yeast plant and that generated in albuminous fluids, and by comparing their microscopic appearances and properties, with the vegetations found in tomatoes, apples, etc., he maintains that there also are identical with the forms.

If this were true the existence of fungi in various situations would cease to be of diagnostic value except as one among many symptoms of a depraved constitution. But if the forms if these are identical, how is it that in Edinburgh where turnip is common, we scarcely ever find an instance of Thrush or Metastasis? Again who could ever mistake the Sarcina for any other vegetation? That some of these
seemed, with few, to be identical; there can be little question. But the various stages of development in the others, their partiality for certain localities, their characteristic appearances even to the naked eye; the fungi always appearing within a capsule of epidermic cells, that of thread on the free surface of numerous membranes, and new extending except in a detached state to the stomach; some attacking the sheath, others the bulbar, interior, their others confined to the fluids of the stomach or bladder, all these facts would prove a difference of habit and organization.

This question can only be satisfactorily determined by those who can compare living specimens. And the observers who seem best entitled to form an opinion upon the subject, as Lythgoe there seem to have no doubt as to the distinction species.

Classification of Entophytes.

While the most eminent Botanists and Pathologists allow the vegetable nature of these parasites, scarce one is expert as to their true relations. As an instance of this we may take the fungi occurring in animals. Broun's

...
places it among the genus Mycotrema of Plessen, J. Mühler thinks it belongs to Bidium, and Lindl. and Klotzsch place it in a new genus which the former calls Behriam. Rostering, who has paid great attention to this order, found it impossible to classify them botanically. There are certainly well marked species which when fully developed may be readily recognised, but the early forms of all are as much alike, and indeed the advanced stages of many, that I find it impossible in the present state of our knowledge to separate one from the other. I am therefore compelled to follow the arbitrary classification hitherto adopted, and shall consider:

1st. flagellates found on the human integument and its appendages; 2nd. those found on mucous membranes; and 3rd. those which are developed in the fluids of the body.

I. Protozoon found on the skin and its appendages:

a. of the Behriam Schroenii (Bidium Schroenii J. Mühler: Mycotrema Behrii: Dugro and nooit) constituting the disease called Pustule lupinosa and P-faciosa. The tunny crust consists essentially of a capsule of epidermic cells, lined by a finely granular mass, from which springs cryptogenic plants.
Fig. 1. Transverse section of favus crust. Showing the capsule lined by molecular matter from which nine branches and spindles.

Fig. 2.  
(a) Isolated crust of favus (P. lata).  
(b) Clusters of fame like a honeycomb (P. favus).  
(c) Crust not perforated by hairs.  
(d) Advanced stage of fame. (Bennett)

Fig. 3. Branches and spindles of the Schizopyx Schlechthin arising from the molecular albuminous matter situated on the epithelial scales. 500 diam.

Fig. 4. Thalli, spores and spindles, showing the mode of reproduction. 800 diam. (Bennett)
The plant is thus characterized by ripe: Schoenleinii, rebi, obiulicae, polium, ericaum, enti humanis presacrum, capitis incisurae, rhizopodium mili, pellicum, floresum, flores tenuissimae, vis articulatae, ramissimae, anastomaticae; mycelium flores crociibos, subramis, distincte articulatae, articulis inaequalibus irregularibus in spiralis adaxialis; spiris in rotunda, rotuli vel irregularis, in una vel multibus latiuscritus prominantibus.

The capsule of fava, is lined by an amorphous mass, composed of finely molecular matter, identical in structure, (according to Blennert), with certain kinds of tubercle. From this the thalli arise branching, dichotomously, in the extremities of these are found one or more spores. The thalli, tubes are from $\frac{1}{400}$ to $\frac{1}{500}$ of a millimeter in diameter, jointed, sometimes branching at irregular intervals, and containing mild. scales, sometimes transparent. The spores range from $\frac{1}{500}$ to $\frac{1}{100}$ of a millimeter in diameter, there are most plentiful in the centre of the capsule, whilst the thalli fibrils and mycelia are more plentiful at the periphery from which they arise. That these vegetatives are developed from
Sprouts is proved by the experiments of Remak. He incubated an apple with them and placed it in moist sand, and observed their mode of germination. The delicate membrane surrounding the sprouts he found to throw out one or more buds, which elongated into filaments; in the extremities of these sprouts after a time were observed to form, as in other vegetations of a like nature.

The disease occurring, in Remak commences with increased wrinkliness and vacuolization of the skin, which is succeeded by bacterial diaphragmatism. Pustules sometimes appear, forming seats but this not essential to its development. At length sulphur-colored spots are observed with a central depression, these at first about the size of a lima nut but gradually enlarge. The edges of the capsule are at first lower than the round skin, but afterwards become raised. There present concentric limina, and as it enlarges the centre becomes convex, and the enclosed vegetative frostbites in the form of which nearly sprouts, encroaching on its edges. Generally the edges of a number of capsules thus formed approach each other, causing a honeycomb appearance, the whole surrounded by an inflamed border.
At length the whole cracks or splits up; all regular form is lost; a dense thicker crust covers the scalp; an oozing, like the urine of beet or mice is evoluted; and in chronic cases, wormy des-\textemdash{nit} the egg in the intestines, and croat in large numbers over the surface. This is accompanied by much irritation and itching, of the part which is still further aggravated by the ineffectual attempts of the patient to relieve it.

This disease generally attacks the hairy scalp of children from three to twelve years of age, either those whose parents have died of phthisis, or who have been exposed to hunger, cold, or closed up in close unhealthy rooms. But it is not always connected with the hair, for it has been found on the forehead, face, arms, abdomen, legs, &c. There has been much dispute as to whether frogs be contagious or no. Bateman, Lillibridge, Mahon and many other writers affirming that it is so, whilst others deny that altogether. Linzey inoculated thirty phaenomenous plants, twenty-four silk worms, live reptiles, four birds, and eight mammals, but only succeeded in repro-\textemdash{ducing} the disease once, and then in a plant. Bennett inoculated his own person several times, without producing,
the characteristic form, crust. This occurred in 1841. Dr. Remak of Berlin, afterwards succeeded in propagating the disease on his own person, by fastening protasis of fowl crusts upon his arms, by means of adhesive plaster. In 1845, Dr. Bennett experimented upon one of his pupils with like success. The subject of this demonstration had light hair, blue eyes, and a very white and delicate skin. That it cannot be transferred more frequently only proves that the plant requires a peculiar soil which it does not find on the healthy skin.

Bennett & Whitehead believe the matter exudes from the skin of susceptible subjects to be necessary for its growth. This idea is supported by the fact that they affect those that they affect, and that they affect serpulous ulcers, and mostly die of phthisis. Theiridea analysis would still further show the analogy between fowl cloacal and tubercle. In 100 parts, he found 90 of coagulated albumen, 17 of globulin, 21 of albumin, 5 of metallic, 20 of carbon, 5 of phosphates of lime, 57 parts.

For further information consult Schoeler in Medizin's Allerlei: 1839, (who first described the vegetation). Remak, Medizinische Zeits. (1840), Bennett, Phil. Trans. 1841, and Lectures of Clinical Medicine, July 1845. Lydeker, Comptes rendus t. X. 1841, Cagnine, Medizinische der Welt: V. XXIX. 1845.
Diagram illustrating the Mentana.

1. Scale surrounding the hair, and loosely connected with the epidermis.
2. Fibres and nucleoli of the Achorian grubii situated between the bulb of the hair and its sheath, and firmly attached to both.
b. *Antarion lybrarii* (Bennett). This plant was first noticed by Lybrary in 1842. He describes it as a species of *Antarion* Montagu, attacking three parts of the face furnished with hair, especially the chin, upper lip, and cheeks. These parts are at first coated with white or yellowish-grey scales, from 2 to 5 millimeters in the short, and from 5 to 8 mm. in their long diameters. They are slightly raised in the centers, loosely attached to the skin, but adhere firmly to the hairs by which they are perforated. These consist entirely of epidermic scales. But beneath them, situated between the sheath and bulb of the hair and completely invest the latter like the finger of a glove, is a layer of matter, which, when examined under the microscope, is found to consist of cryptogenic plants and spores. These spores are small and round, and give off branches presenting a striated appearance at angles from 45° to 80°. These plants originate in the epidermic cells of the hair, and its sheath, to which they are firmly connected, so that the hair cannot be detached from its follicle, without breaking the latter. The plants rise from the root of the hair towards the epidermis,
Diagram showing the part of the hair attacked by
the Rhinose Audreni.
That never project beyond it. Vogel thinks this approaches very nearly the vegetation of Flavus, but it is distinguished from it by having no distinct capsule, by the spores being much smaller and round, and by the stems appearing striated.

Gryby, Comptis centre, 1842. Vogel Pathological Anatomy.

c. Acharion Aubouini (Meningeum Gryby).

This vegetation was first discovered by Gryby in 1843. He found in the white matter which covers the skin, on the ball circular spots of Parente Descalvus (2) cryptogamie plants. These are also found surrounding the hairs as with a sheath from a distance of two or three micrometres above the ball.

The plants originate in the superficial epidermic scales of the hair, from which they cannot be detached. This cryptogamie covering consists of small interlacing stems, branches, and spores. The branches (thalli) run in the direction of the hair fibres, are from $\frac{2}{1000}$ to $\frac{3}{1000}$ of a micrometre in diameter, are transversely and contain no molecules. They terminate at the outer surface of the sheath and are covered with spores. The spores are round or oval, transversely, from $\frac{1}{1000}$ to $\frac{5}{1000}$ of a millimetre in diameter.
Gnathy has named this plant in honor of M. Ambrozin who first discovered the nature of Mucodinae the Bombyx mori.

The disease commences by the hair becoming Argare about two millimeters from the epidermis, and when examined under the microscope, it appears impure and covered by very minute scales; subsequently as the vegetation progresses, the hair become stunted and frizzle, and readily breaks. Like all scabres depending on eutrophic growths, this increases with great rapidity. The blander patches are purplish-white, teemed with a mealy powder. The new hairs are attacked as soon as they appear and give way above the vegetation; around their stumps the parasites accumulate in small patches, which have been mistaken for vesicles or pustules; although the epidermis undergoes no inflammatory change.

This affection as pointed out by Horn* is not the true Pustulose deceases of willow, because the latter patches in their discrises are not covered by any powders or scales, and the hair falls out bringing the pustle with it. Moreover, the former disease is contagious, the latter non-contagious. Most probably it is the Phytopharkia.
Globophyte of Necker tonennan, seated in the root of the hair.

Fragment of hair magnified 300 diam. filled with spirals.
In 1844,ingrowths showed that the disease of the scalp, allied to the blast described, and known as the Rohrer's tonsil and Herpes trophicus of Lagrange, was also caused by an entophyte. M. P. H. Malmoen of Stockholm discovered its nature about the same time.

The cryptogamic plant which causes it differs from the Microsporum Audouinii in attaching the roots and internodes of the hair, not its epithelial covering; it appears to me to be very closely allied to the Rohrer's Gritbid.

When examined under the microscope, the hair fragments taken from the diseased surface are found completely filled with spores which are transp in roundish rows between the fibres. The spores are round, ovoid, transparent, without nuclei, and present a diameter of from $\frac{5}{1000}$ to $\frac{5}{1000}$ mm., about half the size of a yeast globule.

This scab is recognized by the formation of small rough points or rounded spots, more or less continuous, usually on the hairy scalp. These rough points may be compared to those of the substance called chapping, or the skin of the shaft. The hair which comes these spots are broken at the height of one
of two lines above the epitomis, so that from them result small tumours. * These patches are of bluish-white colour, probably depending on the stumps of hair left, and look like the ecdysis anaemia. When rubbed the surface is seen to be covered by a white powder, like flour, among which are fragments of hair and hornules. Around these tumours a number of hairs are observed bent at various angles and jointed, showing the process of the disease.

The shovels first attack the root of the hair, and slowly wound, seldom branches, but become elongated as they reach its centre into articulating filaments.

Malmsten thinks this plant resembles the Coriandrum Olivarcer, of the 8. Aethiops, & Coda.

This disease seems to have been known to the ancients. Celsus calls it Uca, and describes two species, one corresponding with the Alpukia, the other with the Ephirosis of the Greeks.

It is very rare, and it is fortunate that it is so, for in those whom it attacks, mostly stunted children, it spreads insidiously and is very intractable. Minute points are developed on other parts of the body, spreading in an eccentric manner,
"Like the Verbun space
Spemagraudikithotakampolides
Works that should only be said on holidays
When one has nothing else to do"

(And what is a student to do with them who has no holidays?)
at length, (in the language of Maham,) all these circumstances terminate in watering, in being confounded, and in forming of the whole head a surface entirely bald, and covered by the rough points already mentioned. The fungus may also attack the nails.

Malmsten found it communicated from man to child, as from one member to another of the same family several times, and the patients were generally of consumptive origin. He proposes to designate this disease by the horrid word, "Rheumphytophalem."*


E. Sjöstedt in Malmsten's Archiv 1844, p. 34, describes and figures certain fungi which he found in the Phia Phoecias.

The first change in this disease is inflammatory, the bulb of the hair enlarging and becoming sensitive. Soon the sebaceous follicles are obliged to secrete a viscous fluid in much greater quantity than usual.

The entrophla takes root between the sheath and bulb of the hair, and soon spreads to its centre, which they fill.
(a) Hair in Placa Polonica filled with sporules.

(b) Lateral view of an articulating fibre.

Diagram showing the manner in which the hair is split up in this disease, by the development of sporules between its fibres.
they are composed of a great number of spindles and a few articulating fibrils, very like those mentioned in the last paragraph; indeed, Vougl considers them identical with those of the lignum tenacum. The plant is not affected by either acetic acid or liquid potash.

The parasite appears to cause the following changes;—

1st, thickening of the roots and sheath of the hair; 2nd, the plants growing internally, cause the lower part of the hair to bulge out;— 3rd, as the disease advances the spores insinuate themselves between the fibres of the hair, and make them split up, presenting a brush-like appearance, which meeting with the fibrils of the hair unites them into an entangled mass, composed of the spores, viscid fluid from the fibrils, and many fibres of the hairs themselves.

Walther Thunberg also found certain spores which they think of a different species, in the viscid fluid secreted by the hairs. These reflect light, and when placed in water exhibited molecular movements; they do not appear to arrange themselves in waves, nor from fibrilles like the last.

Fig. 1. Tumors found by Mayes in cysts situated on the external auditory process of a girl. Magnified 300 diameters.

Fig. 2. The same under a lower power.

* Many cases of this kind are recorded - see P. J. Horn, De Situ corporis humanum viventi. 1739. M. Lebert also records the occurrence of fungi on neglected ulcers. (Physiologie pathologique, Paris.)
In the class of fungi found on the skin and its appendages, also belong the cases recorded by Prof. Mager's in Born's "Meditations" 1844. The patient was a young girl, eight years old, and of robust habit. The disease was situated on the external ear, and had been uninspectedly treated by several physicians without success. It consisted of a number of round cysts, having an external orifice. To the naked eye they presented a granular, and greenish appearance.

When examined under the microscope the interior of the cysts was found covered with fungi, their stems adhering to their internal surface. These were about \( \frac{1}{3} \) in diameter, and terminated in a head of a green color. Its surface was generally covered by a single or double row of spores which had probably escaped from the sporangium. This observation is interesting because of the fungi being of a higher order than any cyst described, as occurring on man.

The fungi found on the surface of foul places, gangrenous emacres to, are rarely accidental, and are as similar to others found on decomposing emacres, that it is unnecessary to give them particular notice. See, Hulings, "Beihefte zur Königl. Zool. k., 1826."
This plant wanting a name, I have taken the liberty to suggest that Iebry with it.
II. Entophytes found on mucous membranes.

a. Those occurring in the mouth and oesophagus.

1. Microsporum Bergii (Schaik)*

Berguy, Berg, and Berg of Stockholm, discovered about the same period that the atheria phthium was owing to a mycetogenic growth. Dr. Berg gives the most accurate account of this disease, and I shall follow his description.

This consists essentially in a disposition of filamentous molecular matter in the form of points, which lie on the mucous membrane of the mouth facing the oesophagus, from which spring a number of spherical or oval cells, with one or less intertwined web of fibres. These cells are from 1 to 100 - 1,000 in diameter, with a well-defined edge and transparent except those which possess a nucleus. Many of these large cells presented on their periphery a small budding projection, which frequently elongated into a filament. The cells were either isolated or variously grouped, and the void ones especially were observed to form into beaded lines, consisting of from 3 to 6 individuals.

In the intestine, some of these certain molecular masses were observed by Dr. Hille. One can often trace the successive development
Aphthous crust, filament, arising from nodules stroma, epithelial cells, and a few salivary corpuscles.

Shelving, the mode of development in Microb. Barii.
of these cells from a spherical one of the smallest size from 
over cell and then to a filament. These filaments are of 
considerable length, especially in favorable situations, and on an 
average about 1.60 mm in diameter. They form a confused network 
and the fibres become more clearly defined when a weak solution 
of Potash is added, which renders the epithelial cells more clear, 
and dissolves the albuminous matter leaving the parasite altogether un-
altered. The fibres are either simple cylindrical canals, with or 
without septa, or exhibits constrictions and partitions, their intima 
is either transparent or filled with nuclei more or less numerous, 
or with minutely granular matter. From the sides of the fibres 
and especially their extremities, various branches spring which are 
separated from them by a distinct membrane, and in turn give 
rise to new ramifications. The branches take root between the 
epithelial cells, but are generally absent in advanced cases con-
fined to the superficial layers; according to Gump they originate 
in the epithelial cells themselves, but he probably mistaken. The appearance 
presented by the large spaces, while elongating into filaments for those. 
The relative proportions of the epithelium and parasitic growth 
comparing a great vary according to the age of the disease and
Filaments were highly magnified showing their jointed character, and the mode in which they give off spores. A spore elongating into a filament.

Elimination of above tubes now highly magnified.
more or less exposed condition of the aphthous patches. Thus on surfaces exposed to much friction, or on parts where eddies abound we find few or no pustules, hence they do not extend into the auditory ducts, ear tubes, etc., or in an attached state beyond the cardiac orifice of the stomach, while on empty, much furrowed areas several layers of epithelial cells exist as between papillae and on parts where no eddies are found or in those little subject to friction they abound plentifully. Again we find them much less numerous in children, brought up at home, and at the breast than in public dispensaries where the mouth is seldom cleaned and they are served by the hand. The colours of the aphthous patches make these changes evident. For whereas in early cases they are of a nearly white colour, we find them in the latter assuming a yellow or greenish hue which we should expect when cryptogamie operations are abundant. This disease generally attacks baptism or the less children, and it always varies the reactions of the mouth and stomach acids. St. Beaz found that out of the body the crusts produced lactic fermentation in solutions of copper and albumen, and like change were produced in solution starch, milk, etc.

Vegetations of the kind described last are not uncommon on the teeth and gums of persons subject to indigestion, especially those of a renal constitution and these perhaps serve to nourish the infections which according to Martin and Ehmera[2] build up the tartar on the teeth in the same way that certain certain soils consist of their nephriticated skeletons. What would make this probable is the fact that the tartar is so much more abundant in such persons — M. Robert finds the tartar in Jones by the vegetations.

Langenbeck (1839) and Bennett (1842) have also observed vegetations of a like nature in the black mucus which accumulates in the gums and teeth of patients suffering from typhoid fever.

Moreover, the Microsporum fungus abounds in the aphthous patches and sores attacking the mouths of patients in the last stages of phthisis, and must greatly aggravate the systemic irritation by rendering the secretions of the mouth and stomach habitually acid.

The benefit derived by alkaline drinks in such cases must be evident, as the opposite practice is decidedly injurious.

It appears that algae are very commonly developed among the white matter found between the teeth, especially of persons who do not see the brush, they also abound in the torturous
Vegetations found on the teeth.
1. Fibres of various length. 2. Bodies observed by Buehlmann.

* Robin, des Vegetanye qui vivissent sur l'Homme, 1847, p. 43.

(Fig. 3) Engorg of the Leptomonas (Acanth.), from the ulcerated mucous membrane of the cheek. (4) Filament more highly magnified a. spicules.

† Hannover (Arch de Mebela, 1842).
Purvis both, and are found floating in a detached state among the bacterial masses. They consist mostly of filaments arranged in a very manner of the same diameter throughout and having no partitions. Along with them we discovered various animalcules which are much smaller and very active, such as Bacillus typhosus, V. influenza, M. typhosus, V. cholera, and V. parietalis, etc.

Buchhmann also describes beautiful twisting filaments originating from a round or oval granular substance; they are more rare than the other filaments. Fournier and Valentin have observed the same. M. M. Corvisart and Robin found the filaments above mentioned in immense quantity among the fluids in the stomach of a woman who died of jaundice; and Entz has discovered them in fecal matter. They appear to be allied to Hygroscopics. These facts show that this plant can secrete itself in various situations, and is not characteristic of any diseased state.

Stanum mentions certain vegetatines occurring in a cloudy mass, which covers the epidermis of a man. When examined the part presented opeletiniae but there were no particular symptoms. He considers they belong to the genus leptomitorus and has drawn the same in typhoid patients.

* M. Raye (1842) and Remarck (1845) have also confirmed the observations of R. Bennett.
6. Pathology found in the lungs, etc.

Dr. Bennett, while making microscopic examinations of tubercles and the lining membrane of the Alveoli, frequently found fragments of tubercles of less jointed and nerved together which he supposed to be by vegetable nature. This supposition was often verified by the case of a man in the last stage of phthisis, and also suffering from pleuris-thorax. The examination the matter deposited by this man, he found it to consist of long tubes, regularly jointed, from $\frac{1}{100}$ to $\frac{1}{1000}$ of an inch in diameter, and variously branching; the edges were well defined and the tubes contained no granules within them. They appeared to arise from an amorphous molecular mass. Interspersed among these tubes were numerous round and oval cells, from $\frac{1}{75}$ to $\frac{1}{100}$ of a mm. in diameter, which occasionally aggregated together forming gland-like masses. They were most plentiful in the visceral parts, which adhered to the sides of the phthis-thorax. After death, the left lung was found studded with tubercles, and there were various cavities, some which communicated by fistulous openings with the pleura; they were covered by vegetations.

In the disease called fibrous meningitis, it is very probable that euphorbion plants will be found.
C. Algae found in the Intestines.

Dr. Thomas Fewer describes the case of a middle-aged woman who expelled by stool substances having the appearance of shreds of false membrane. Examined under the microscope, they were found to consist entirely of an extensive mass of very delicate conoid or filamentous. They were of a pale green colour and exhibited articulations at regular distances, marking their division into cells, as in Ocellatoria and other allied species. The filaments measured 1/200 inch in diameter, they varied much in length; the ends of some were abruptly fractured, others had the appearance of branching dichotomously. This patient had been suffering for some time from slight indisposition, about twelve hours before passing the substances she felt considerable pain and uneasiness in the abdomen. There were the only symptoms. See Microscopic Journal, vol. 2, p. 189. Dr. Bennett has described a similar case in the Monthly Journal of Medical Science, 1848.

D. Vegetations found in the Vagina.

Mr. Wilkinson in the Lancet, 1849, records the case of an old woman, aged 77, who discharged from her vagina purulent matter containing a quantity of delicate filaments like fresh water algae.
(Fig. 1) Alga from the vagina. (2) Same with acetie acid.

* Leptothrix (Dimb. Med. Journ. No 151.)
Examined under the microscope it was found to consist of a number of filaments, round and oval cells and spangles, and a molecular network.

The filaments were of two kinds: the one from \( \frac{1}{100} \) to \( \frac{1}{1000} \) mm. in diameter, the other about six times as large. The latter terminated at one end in a truncated manner, and gave off from the other a branch of from six to seven of the secondary filaments. They were enlarged in certain places, probably containing spores.

Acetic acid showed the smaller filaments to consist falciform cells. The spangles were observed of all sizes and in various stages of development from the spangle to the filament.

The vagina was healthy, and there, conpases were developed in the uterus. Wilkinson proposes to name the plant *Loomia Uteri* but it appears to me to be very much like if not identical with that found by Blenell in the case of pneumo-thorax, and probably both are modified forms of the *Penicillum flavum* (Link).

### Entophytes found in the fluids of the body

1. *Sarcena Ventriculi* (Gosseii)

This plant was first discovered by Gosseii in the fluid ejected from the stomach of a patient nineteen years old and subject to dyspepsia and who every morning without effort discharged...
Fig. 1. The Saccana Ventricle (Hypsia).

Fig. 2.

The Saccana cells observed in the fluid along with the saccana, and from which Bruce thinks it is developed, but they seem to me to be more like Turula.
a quantity of fluid smelling like fermenting wort. When submitted to the microscope it was found to contain a number of square or oblong bodies, in the perfect form $\frac{1}{1000}$ of an inch linear along each of their surfaces, and about $\frac{1}{4}$ of this in thickness. They presented exactly the appearance of a wool-flock, hence the name. The edges were well defined, and each individual was divided by cirrus lines into four secondary squares, and each of these in turn was composed of four cells, so that the perfect plant consists of 16 compartments.

These bodies have since been observed by Brook who considers them not to be vegetable parasites, from their sudden occurrence and disappearance, but this is not stranger than in many other fungi.

In all cases where they have been found, the fluid of the stomach after standing for some time underwent a kind of fermentation, and a brownish flocculent matter rose to the top like a yeasty froth. It was found to contain lactic and acetic acids in harnorous proportion.

This plant does not appear to produce any particular symptoms except vomiting. Link thinks it is a Lycomium, but Hooker, Virchow, Schlesserhenge and others seem to assign it to its vegetable nature.

Figures of the Torula will be found at page 62. (fig. 2 a b.)

Figures of the Torula Ceracea. After different authors.
2. **Torula cerevisiae**

This is probably a much more common plant than supposed throughout the intestinal mucous tract.

It consists of round or oval cells, varying in diameter from the foot to the height of a line, and many contain nuclei. They open by protrusion of buds, which soon attain the size of their parents, and remain attached to them in large masses. If from three to five individuals. Sometimes we observe a mother cell enlarge, and produce and sporule, from within it; it ultimately bursts and liberates them. In more advanced stages they form filaments like many of the vegetatives already considered. But the two scells are the most frequent and characteristic form.

It only multiplies in fluids susceptible of fermentation. It has been found in the fluids of the esophagus, stomach and intestines. It may be introduced with fermented liquors or arise in a different way, and possess no particular pathological value. It often occurs also in the urine of diabetic patients, but probably never until it has passed from the bladder, but we occasionally find it in the intestines of healthy beings. See Vogel: Pathological Anatomy, Schwann on Fermentation.
Various accidental fungi introduced with the fluids and liquids taken, as well as those developed in the mouth, have been found in the feces, or fluids vomited by patients, but as they possess no pathological value, their enumeration would be as tedious as unprofitable. It might be expected also that in a paper of this kind I should not forget the cholera fungi, which has given rise to so much controversy. But as the various fungi described as it have either proved to be well known species such as the Molds, or are commonly no plants at all, I think it unnecessary to enquire on the subject. In conclusion it must be borne in mind that whereas there is a rapid change in the solids or fluids of the body, especially where there undergo fermentation, or where the secretions are altered in some unknown manner as in Cholera, we may expect to find vegetations of a low-nari developed among them.

Finis.