Andrew CROSSE

Abiogenesis of Acari

Introduction:

In 1837, Andrew Crosse reported to the London electrical Society concerning the accidental spontaneous generation of life in the form of Acurus genus insects while he was conducting experiments on the formation of artificial crystals by means of prolonged exposure to weak electric current. Throughout numerous strict experiments under a wide variety of conditions utterly inimical to life as we know it, the insects continued to manifest. The great Michael Faraday also reported to the Royal Institute that he had replicated the experiment. Soon afterwards, all notice of this phenomenon ceased to be reported, and the matter has not been resolved since then.

Contents:

(1) A. Crosse: *The American Journal of Science & Arts*; Vol. 35: 125-137 (January, 1839) ~ Reprint of *Annals of Electricity, Magnetism, & Chemistry*, vol. 2: 246-257 (January-June 1838)

(2) M. Roberton: *Annals of Electricity, Magnetism & Chemistry*, Vol. 2: 355-360 (January-June 1838) ~ Reprint of Comptes Rendu Acad. Sci. Paris (November 13, 1837); Note on a kind of Acarus presented to the Academy.

(3) Sir David Brewster: *British Association Report* (1855), page 9: On the Existence of Acari in Mica

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(1) A. Crosse: *The American Journal of Science & Arts*; Vol. 35: 125-137 (January, 1839) ~ Reprint of *Annals of Electricity, Magnetism, & Chemistry*, vol. 2: 246-257 (January-June 1838)

Description of some Experiments made with the Voltaic Battery; by Andrew Crosse, esq., of Broomfield, near Taunton, for the purpose of producing Crystals; in the process of which Experiments certain Insects constantly appeared. [Reprinted from the Transactions of the Electrical Society of London]

My dear Sir -- I trust that the gentlemen who compose the "Electrical Society" will not imagine that I have so long delayed answering their request, to furnish the Society through you, as its organ, with a full account of my electrical experiments, in which a certain insect made its unexpected appearance, that such delay has been occasioned by any desire of withholding what I have to state, from the Society in particular, or the public at large. I am delighted to find that at last, late, though not the less called for, a body of scientific gentlemen have linked themselves together for the sake of exploring and making public those mysteries, which hitherto, under a variety o names, and ascribed to all causes but the true one, have eluded the grasp of men of research, and served to perplex, perhaps, rather than to afford sufficient data to theorize upon. It is true that much has been done in the course of a few years, and that which has been done only affords the strongest reason for believing that vastly more remains to be done. It would be presumptuous in me to enumerate the services of a Davy, a Faraday, and many other great men at home, or a Volta and an Ampere, with a host of others abroad. These distinguished men have laid the foundations, on which their successors ought to endeavor to erect a building worthy of the scale in which it has been commenced. Electricity is no longer the partly confined science which it was once fancied to be, making its appearance only from the friction of glass or wax, employed in childish purposes, serving as a trick for the schoolboy, or a nostrum for the quack. But it is, even now, though in its infancy, proved to be most intimately connected in all operations in chemistry, with magnetism, with light and caloric; apparently a property belonging to all matter, perhaps ranging through all space, from sun to sun, from planet to planet, and not improbably the secondary cause of every change in the animal, mineral, vegetable, and gaseous systems. It is to determine whether this be or not the case, as far as human faculties can determine, to ascertain what rank in the tree of science electricity is to hold; to endeavor to find out to what useful purpose it might be applied, that I conceive is the object of your Society, and I shall at all times be ready and willing, as a member, to contribute my quota of information to its support, knowing well, that however little it might be, it will be as kindly received as it is humbly offered. It is most unpleasing to my feelings to glance at myself as an individual, but I have met with so much

virulence and abuse, so much calumny and misrepresentation, in consequence of the experiments which I am about to detail, and which it seems in this 19th century a crime to have made, that I must state, not for the sake of myself (for I utterly scorn all such misrepresentations), but for the sake of truth and the science which I follow, that I am neither an "atheist", nor a "Materialist", nor a "self imagined creator", but a humble and lowly reverencer of that Great Being, whose laws my accusers seem wholly to have lost sight of. More than this, it is my conviction, that science is only valuable as a means to a greater end. I can assure you, sir, that I attach no particular value to any experiment that I have made, and that my feelings and habits are much more of a retiring than an obtruding character; and I care not I what I have done be entirely overthrown, if truth be elicited. The following is a plain and correct account of the experiments alluded to.

In the course of my endeavors to form artificial minerals by a long continued electric action on fluids holding in solution such substances as were necessary to my purpose, I had recourse to every variety o contrivance which I could think of, so that, on the one hand, I might be enabled to keep up a never-failing electrical current of greater or lesser intensity or quantity, or both, as the case seemed to require; on the other hand, that the solutions made use of should be exposed to the electric action in the manner best calculated to effect the object in view. Amongst other contrivances, I constructed a wooden frame, of about 2 feet in height, consisting of 4 legs proceeding from a shelf at the bottom, supporting another at the top, and containing a third in the middle. Each of these shelves was about 7-inches square. The upper one was pierced with an aperture, in which was fixed a funnel of Wedgwood ware, within which rested a quart basin on a circular piece of mahogany placed within the funnel. When this basin was filled with a fluid. A strip of flannel wetted with the same, was suspended over the edge of the basin and inside the funnel which, acting as a siphon, conveyed the fluid out of the basin, through the funnel, in successive drops. The middle shelf of the frame was likewise pierced with an aperture, in which was fixed a smaller funnel of glass, which supported a piece of somewhat porous red oxide of iron from Vesuvius, immediately under the dropping of the upper funnel. The stone was kept constantly electrified by means of 2 platina wires on either side of it, connected with the poles of a Voltaic battery of 19 pairs of 5-inch zinc and copper single plates, in two porcelain troughs, the cells of which were filled at first with water and 0.3% of hydrochloric acid, but afterwards with water alone. I may state here, that in all my subsequent experiments relative to these insects, I filled the cells of the batteries employed with nothing but common water. The lower shelf merely supported a wide-mouthed bottle, to receive the drops as they fell from the second funnel. When the basin was nearly emptied, the fluid was poured back again from the bottle below into the basin above, without disturbing the position of the stone. It was by mere chance that I selected this volcanic substance, choosing it from its partial porosity; or do I believe that it had the slightest effect in the production of the insects to be described. The fluid with which I filled the basin was made as follows.

I reduced a piece of black flint to powder, having first exposed it to a red heat and quenched it in water to make it friable. Of this powder I took two ounces, and mixed them intensely with 6 ounces of carbonate of potassa, exposed them to a strong heat for 15 minutes in a black lead crucible in an air-furnace, and then poured the fused compound on an iron plate, reduced it to a powder while still warm, poured boiling water on it, and kept it boiling for some minutes in a sand bath. The greater part of the soluble glass thus fused, was taken up by the water, together with a portion of alumina from the crucible. I should have used one of silver, but had none sufficiently large. To a portion of

the silicate of potassa thus fused, I added some boiling water to dilute it, then slowly added hydrochloric acid to supersaturation. A strange remark was made on this part of the experiment, at the meeting of the British Association in Liverpool, it being then stated, that it was impossible to add an acid to a silicate of potassa without precipitating the silica! This, of course, must be the case, unless the solution be diluted with water. My object in subjecting this fluid to a long-continued electric action, through the intervention of the porous stone, was to form, if possible, crystals of silica at one of the poles of the battery, but I failed in accomplishing this by those means. On the 14th day from the commencement of the experiment, I observed, through a lens, a few small white excrescences or nipples projecting from about the middle of the electrified stone, and nearly under the dropping of the fluid above. On the 18th day, these projections enlarged, and 7 or 8 filaments, each of them longer than the excrescence from which t grew, made their appearance on each of the nipples. On the 22nd day, these appearances were more elevated and distinct, and on the 26th day, each figure assumed the form of a perfect insect, standing erect on a few bristles which formed its tail. Till this period I had no notion that these appearances were any other than an incipient mineral formation; but it was not until the 28th day, when I plainly perceived these little creatures move their legs, that I felt any surprise, and I must own that when this took place, I was not a little astonished. I endeavored to detach, with the point of a needle, one or two of them from its position on the stone, but they immediately died, and I was obliged to wait patiently for a few days longer, when they separated themselves from the stone, and moved about at pleasure, although they had been for some time after their birth apparently averse to motion. In the course of a few weeks, about a hundred of them made their appearance on the stone. I observed that at first each of them fixed itself for a considerable time in one spot, appearing, as far as I could judge, to feed by suction; but when a ray of light from the sun was directed upon it, it seemed disturbed, and removed itself to the shaded part of the stone. Out of about a hundred insects, not above 5 or 6 were born on the south side of the stone. I examined them with the microscope, and observed that the smaller ones appeared to have only 6 legs, but the larger ones 8. It would be superfluous to attempt a description of these little mites, when so excellent a one has been transmitted from Paris. It seems that they are of the genus Acarus, but of a species not hitherto observed. I have had 3 separate formations of similar insects at different times, from fresh portions of the same fluid, with the same apparatus. As I considered the result of my experiment rather extraordinary, I made some of my friends acquainted with it, amongst whom were some highly scientific gentlemen, and they plainly perceived the insect in various states. I likewise transmitted some of them to one of our most distinguished physiologists in London, and the opinion of this gentleman, as well as of other eminent persons to whom he showed them, coincided with that of the gentleman of the Academie des Sciences, as to their genus and species. I have never ventured an opinion as to the cause of their birth, and for a very simple reason -- I was unable to form one. The most simple solution of the problem which occurred to me, was that they arose from ova deposited by insects floating in the atmosphere, and that they might possibly be hatched by the electric action. Still, I could not imagine that an ovum could shoot out filaments, and that those filaments would become bristles; and moreover, I could not detect, on the closest examination, any remains of a shell. Again, we have no right to assume that electric action is necessary to vitality, until such fact shall have been most distinctly proved. I next imagined, as others have done, that they might have originated from the water, and consequently made a close examination of several hundred vessels, filled with the same water as that which held in solution the silicate of potassa, in the same room, which vessels constituted the cells of a large Voltaic battery, used without acid. In none of these vessels could I perceive the trace of an insect of that description. I likewise closely examined the crevices and most dusty parts of the room with no better success. In the course of some months, indeed, these insects so increased, that when they were strong enough to leave their moistened birthplace, they issued out in different directions, I suppose in quest of food; but they generally huddled together under a card or piece of paper in their neighborhood, as if to avoid light and disturbance. In the course of my experiments upon other matters, I filled a glass basin with a concentrated solution of silicate of potassa without acid, in the middle of which I placed a piece of brick, used in the neighborhood for domestic purposes, and consisting mostly of silica. Two wires of platina connected either end of the brick with the poles of a Voltaic battery of 63 pairs of plates, each about 2 inches square. After many months action, silica in a gelatinous state formed in some quantity round the bottom of the brick, and as the solution evaporated, I replaced it by fresh additions, so that

the outside of the glass basin, being constantly wet by repeated overflowings was, of course, constantly electrified. On this outside, as well as on the edge of the fluid within, I one day perceived the well known whitish excrescence, with its projecting filaments. In the course of time, they increased in number, and as they successively burst into life, the whole table on which the apparatus stood, at last was covered with similar insects, which hid themselves wherever they could find a shelter. Some of them were of different sizes, there being a considerable difference in this respect between the larger and the smaller; and they were plainly perceptible to the naked eye, as they nimbly crawled from one spot to another. I closely examined the table with a lens, but could perceive no such excrescence as that which marks their incipient state, on any part of it. While these effects were taking place in my electrical room, similar formation were making their appearance in another room, distant from the former. I had placed on a table three Voltaic batteries, unconnected with each other. The first consisted of 20 pairs of 2-inch plates, between the poles of which I placed a glass cylinder, filled with a concentrated solution of silicate of potassa, in which was suspended a piece of clay slate by 2 platina wires connected with either pole of the battery. A piece of paper was placed on top of the cylinder, to keep out the dust. After many months' action, gelatinous silica in various forms was electrically attracted to the slate, which it coated in a rather singular manner, unnecessary here to describe. In the course of time, I observed similar insects, in their incipient state, forming around the edge of the fluid within the jar, which, when perfect, crawled about the inner surface of the paper with great activity. The second battery consisted of 20 pairs of cylinders, each equal to a 4-inch plate. Between the poles of this, I interposed a series of seven glass cylinders, filled with the following concentrated solutions: (1), nitrate of copper; (2) subcarbonate of potassa; (3) sulfate of copper; (4) green sulfate of iron; (5) sulfate of zinc; (6) water with a minute portion of hydrochloric acid; (7) water poured on powdered metallic arsenic, resting on a copper cup, connected with the positive pole of the battery. All these cylinders were electrically united together by arcs of sheet copper, so that the same electric current passed through the whole of them.

After many months' action, and consequent formation of certain crystalline matters, which it is not my object here to notice, I observed similar excrescences with those before described at the edge of the fluid in every one of the cylinders, excepting the two which contained the carbonate of potassa, and the metallic arsenic; and in due time a host of insects made their appearance. It was curious to observe the crystallized nitrate and sulfate of copper, which formed by slow evaporation at the edge of the respective solutions, doted here and there with these hairy excrescences. At the foot of each of the cylinders, I had placed a paper ticket on the table, and on lifting them up, I found a little colony of insects under each, but no appearance whatever of their having been born under their respective papers, or on any part of the table. The third battery consisted of 20 pairs of cylinders, each equal to a 3-inch plate. Between the poles of this I interposed likewise a series of 6 glass cylinders, filled with various solutions, in only one of which I obtained the insect. This contained a concentrated solution of silicate of potassa. A bent iron wire, one-fifth of an inch in diameter, was plunged some inches into this solution, and connected with the positive pole, whilst a small coil of fine silver wire joined it with the negative.

After some months' electrical action, gelatinous silica enveloped both wires, but in much greater quantity at the positive pole; and in about 8 months from the commencement of the experiment, on examining these two wires very minutely by means of a lens, having removed them from the solution for that purpose, I plainly perceived one of these incipient insects upon the gelatinous silica on the silver wire, and about half an inch below the surface of the fluid, when replaced in its original position. In the course of time, more insects made their appearance, till at last, I counted at once 3 on the negative and 12 on the positive wire. Some of them were formed on the naked part of the wires, that is, on that part which was partially bare of gelatinous silica, but they were mostly imbedded more or less in the silica, with 8 or 10 filaments projecting from each beyond the silica. It was perfectly impossible to mistake them, after having made one's self master of their different appearances; and an occasional motion in the filaments of those that had been the longest formed was very perceptible, and observed by many of my visitors, without my having previously noticed the fact to them. Most of these productions took place from half to three-quarters of an inch under the surface of the fluid, which, as it evaporated very slowly, I kept to the same level by adding fresh

portions. As some of these insects were formed on the inverted part of the siphon-shaped wire, I cannot imagine how they contrived to arrive at the surface, and to extricate themselves from the fluid: yet this they did repeatedly; their old places were vacated, and others were born in new ones. Whether they were in an imperfect state (except just at the commencement of their formation), or in a perfect one, they all had the distinguishing characteristic of bristles projecting from their bodies, which occasioned the French savant to remark that they resembled a microscopic porcupine. I must not omit to state, that the room in which these three batteries were acting was kept almost constantly darkened. It was not my intention to make known these observations until I myself should be better informed about the matter. Chance led to the publication of an erroneous account of them, which I was under the necessity of explaining. It is so difficult to arrive at the truth, that mankind would do better to lend their assistance to explore what may be worth investigating, than to endeavor to crush in its bud that which might otherwise expand into a flower. In giving this account, I have merely stated those circumstances regarding the appearance of insects, which I have noticed during my investigations into the formation of mineral matters; I have never studied physiology, and am not aware under what circumstances the birth of this class of insects is usually developed. In my first experiment I had made use of flannel, wood, and a volcanic stone; in the last, none of these substances were present. I never, for a moment, entertained the idea that the electric fluid had animated the organic remains of insects, or fossil eggs, previously existing in the stone or the silica; and have formed no visionary theory which I would travel out of my way to support. I have since repeated these latter experiments in a third room, in which there are now two batteries at work. One consists of 11 pairs of cylinders, made of 4-inch plates, between the poles of which is placed a glass cylinder, filled with silicate of potassa, in which is suspended a piece of slate between two wires of platina, as before, and covered loosely with paper. Here, again, is another crop of insects formed. The other battery consists of 20 pairs of cylinders, the electric current of which is passed through six different solutions in glass cylinders, in 3 of which only is the insect forming, viz., ist, in nitrate of copper, 2nd, in sulfate of copper, in each of which the insect is only produced at the edge of the fluid, as far as I can make out; and 3rd, by the old apparatus of coiled silver and iron wire in silicate of potassa, as before. There are now forming on the bottom of this positively electrified wire similar insects, at the distance of fully 2 inches below the surface of the fluid. On examining these, I have lately noticed a peculiar quality they possess whilst in the incipient state. After being kept some minutes out of the solution, they contract their filaments, so as, in some cases, wholly, and in others partially, to disappear. I at first thought they were destroyed, but on examining the same spots, on the next day, they were as perceptible as before. In this respect, they seem not unlike the zoophytes, which adhere to the rocks on the seashore, and which contract on the approach of a finger. I may likewise remark, that I have not been able to detect their eyes, even when viewed under a powerful microscope, although once I fancied I perceived them. The extreme heat of summer and cold of winter do not appear to favor their production, which succeeds best, I think, in spring and autumn. As in the above account I have occasionally made use of the word "formation", I beg that it might be understood that I do not mean creation, or any thing approaching it. I am not aware that I have anything more to add, except a few remarks I shall conclude with.

1st: I have not observed a formation of the insect, except on a moist and electrified surface, or under an electrified fluid. By this I do not mean to assert that electricity has anything to do with their birth, as I have not made a sufficient number of experiments to prove or disprove it; and besides, I have not taken those necessary precautions which present themselves even to an unscientific view. It is, however, my intention to repeat these experiments, by passing a stream of electricity through cylinders filled with various fluids under a glass receiver inverted over mercury, the greatest possible care being taken to shut out extraneous matter. Should there be those who blame me for not having done this before, to such I answer that, independent of a host of other hindrances, which it is not in my power to put aside, I have been closely pursuing a long train of experiments on the formation of crystalline matters by the electric agency, and now different modifications of the Voltaic battery, in which I am so interested, that none but the ardent can conceive what is not in my power to describe.

2nd: These insects do not appear to have originated from others similar to themselves, as they are formed in all cases with access of moisture, and in some cases 2 inches below the surface of the fluid

in which they are born; and if a full grown and perfect insect be let fall into any fluid, it is infallibly drowned.

3rd: I believe they live for many weeks: occasionally I have found them dead in groups, apparently from want of food.

4th: It has been frequently suggested to me to repeat these experiments without using the electric agency; but this would be by no means satisfactory, let the event be what it would. It is well know that saline matters are easily crystallized without subjecting them to the electric action; but it by no means follows that, because artificial electricity is used, such crystals are formed without the electric influence. I have made so many experiments on electrical crystallization, that I am firmly convinced in my own mind, that electric attraction is the cause of formation of every crystal whether artificial electricity be applied or not. I am, however, well aware of the difficulty of getting at the truth in these matters, and of separating cause from effect. It has often occurred to me, how it is that such numbers of animacules are produced in flour and water, in pepper and water? Also, the insects which infest fruits after a blight? Does not a chemical change take place in the water, and likewise in the sap of the tree previous to the appearance of these insects, and is or is not every chemical change produced by electric agency? In making these observations I seek to mislead no one. The book of Nature is opened wide to our view by the Almighty power, and we must endeavor, as far as our feeble faculties will permit, to make good use of it, always remembering, that however the timid may shrink from investigation, the more completely the secrets of nature are laid bare, the more effectually will be the power of that Great Being be manifested, who seems to have ordained that, "Order is Heaven’s first law".

I beg to remain, in the mean time, my dear Sir,
Yours, very sincerely,

Andrew Crosse
Broomfield, Dec. 27, 1837

P.S. -- Since writing the above account, I have obtained the insects on a bare platina wire plunged in fluo-silicic acid, one inch below the surface of the fluid at the negative pole of a small battery of 2-inch plates in cells filled with water. This is a somewhat singular fluid for these insects to breed in, who seem to have a flinty taste, although they are by no means confined to siliceous fluids. This fluo-silicic acid was procured from London some time since, and consequently made from London water, so that the idea of their being native to Broomfield water is quite set aside from this result. The apparatus was arranged as follows: (1), in Figure 7, a glass basin (a pint one) partly filled with fluo-silicic acid to the level 1. (2) is a small porous pan, made of the same materials as a garden pot, partly filled with the same acid to the level 2, with an earthen cover (3) placed upon it, to keep out the light, dust, &c. (4), a platina wire connected with the positive pole of the battery, with the other end plunged into the acid in the pan, and twisted round a piece of common quartz; on which quarts, after many months' action, are forming singularly beautiful and perfectly formed crystals of a transparent substance, not yet analyzed, as they are still growing. These crystals are of the modification of the cube, and are of 12 or 14 sides. The platina wire passes under the cover of the pan. (5), a platina wire connected with the negative pole of the same battery, with the other end dipping into the basin, an inch or two below the fluid, and, as well as the other, twisted around a piece of quartz. By this arrangement it is evident that the electric fluid enters the porous pan by the wire (4), percolates the pan, and passes out by the wire (5). It is now upwards of 6 or 8 months (I cannot at this moment put my hand on the memorandum of the date) since this apparatus has been in action, and though I have occasionally lifted out the wires to examine them by a lens, yet it was not until the other day that I perceived any insect, and there are now three of the same insects, in their incipient state, appearing on the naked platina wire at the bottom of the quartz in the glass basin at the negative pole. These insects are very perceptible and may be represented thus (magnified) Figure 8, (1) the platina wire, 92) the quartz, (3) the incipient insects. It should be observed that the glass basin, Figure 7, has always been loosely covered with paper. The incipient appearance of the insect has already bee described. The filaments which project are in the course of time seen to move, before the perfect insect detaches itself from its birthplace.

Figure (I): Figures (5), (6), (7) & (8) = Figure (56), (57), (58) & (59) ~

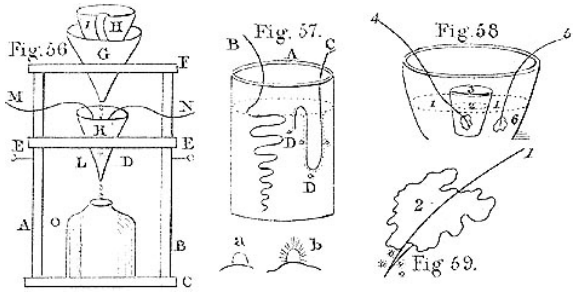


Figure 5: Front view of the filtering apparatus, by the use of which, the insect described made its first appearance. (A, B), two of the four uprights or legs issuing from the base (C), supporting a movable shelf (D), which shelf is kept in its place by four pins (E) passing through the four uprights, and may be raised or lowered at pleasure. (F), the top shelf, which has an aperture cut in it to receive the Wedgwood ware funnel (G). (H), a quart basin standing on an unseen support within the funnel (G), which support is a circular piece of wood with holes cut in it to allow the free passage o the fluid between the basin and funnel. This basin is filled with the fluid required, which is conveyed out o it by the strip of flannel (I), hanging over the outside of the basin, and inside the funnel, and which consequently falls in successive drops through the funnel (G) upon the stone (K), which is supported by the glass funnel (L), kept constantly electrified by the two platina wires (M, N) resting upon the

opposite sides of it, and connected with the opposite poles of a voltaic battery. (O), a wide mouthed bottle standing on the base (C) to receive the fluid as it falls from the second funnel (L). From this bottle, when required, it is poured back again into the basin (H) without disturbing the stone (K).

Figure 6: (A), a glass cylindrical vessel, containing about a quarter of a pint, filled with a concentrated solution of silicate of potash. (B), a fine silver wire formed into a coil, which is immersed into the fluid in the cylinder, the other end being connected with the negative pole of the battery. (C), an iron wire about one-fifth of an inch in diameter, bent somewhat in the form of an inverted siphon, immersed in the same vessel, and connected either the positive pole of the battery. (D,D), insects in their incipient state make their appearance, some on the gelatinous silica which partially covers the wire, and someone the naked wire itself. These insects appear magnified.

Annals of Electricity, Magnetism & Chemistry, Vol. 2: 355-360 (January-June 1838)

LVII. Note on a kind of Acarus presented to the Academy, at the Session of the 30th of October, by M. Roberton, to whom Mr. Crosse had communicated it; by M. Turpin. From Comtes Rendus, &c, November 13, 1837. Translated by Mr. J. H. Lang.

Extract:

The acarus of Mr. Crosse, a single specimen of which was preserved in spirit of wine contained in a small phial, offered for our examination the following characteristics.

Seen by the naked eye, when enclosed in the vessel, it appeared merely as a whitish speck, which from its specific gravity always occupies the bottom of the phial.

A small oval body, bristled with long and diverging hairs, is seen by means of a lens.

Taken out of the alcohol, dried as much as possible, and then placed between two plates of glass, in a fine bed of white varnish, so as to render all its parts more transparent, and consequently more easy to study, we submitted it to the action of the microscope, which magnified about 280 times.

By this mode of observation we perceived that the body was of an oval form, the belly slightly flattened, and the back very round, particularly towards the hind end of the body.\

The skin of the back appeared chagrined, or as strewed with an infinite number of very small tubercles, of which a certain number, larger than the others, distributed here and there, serve as a base or bulb for long hairs or silks, which are at least as long as the body of the animal.

All these hairs fixed and raised on the protuberant back of this kind of acarus, give it the appearance of a microscopic porcupine, to which the elongated snout also contributes.

We have not been able to discover, by transparency, any trace of stomach, ovary, or lateral pulmonary organs.

The anus is feebly distinguishable by a slight inclination situated in the direction of the median line, and the posterior part of the abdomen.

But a large oval egg is clearly seen, like these, often to the amount of two, three, or eve four, which are seen in the transparent body of the domestic female acari of cheese and meal (Acarus siro Fab.), and in those of the same sex, of the acarus of human mange (Acarus scabici Fab.), as is seen in the drawing we have the honor to lay before the Academy.

This egg, both ends of which are equal, and whose length is 1-7th of a millimeter, is so far remarkable, that it is found in the single individual sent by Mr. Crosse, as if chance had intended to furnish us with a material proof of the manner of reproduction, well known among the Acarians, of this acarus which is thought to be produced at pleasure, without a mother preceding it, and by the aid only of elementary molecules floating in the space.

From the front part of the body emanates an elongated snoutish head, very difficult to study in its composition; but in which we can clearly see an upper lip sloping to its extremity, under which is situated a tongue in the form of a stiletto; and beneath which again, but situated laterally, are perceived two large moveable jaws, pointed and slightly bent from without and within. It is probable these jaws terminate in a point. Further in, and directed in the same way, appear two palpes, shorter than the jaws, and almost hidden by them and the lip which protects them.

Having only a single individual at our disposal, it was impossible for us to prove the existence of an underlip, so large and apparent in the acarus of the human scab.

We have not been more fortunate in regard to the two small smooth eyes, situated on the neck of the species of this genus.

From a sort of elongated narrow breast bone proceed eight appendicular locomotive members, joined and directed, the four anterior ones before, and the four posterior ones behind. They are all composed of the same number of pieces; but one thing which may be remarked in many insects, arachnids and crustaces, the two pair of anterior paws are shorter, thicker, and more robust than the inferior ones, which are longer, and at the same time more thin. This difference, scarcely perceptible in the acari of cheese and meal, is very great in the acarus of the human scab, when, without an attentive examination, we should be almost tempted to see different organs in the two posterior pair of paws, which, in fact, are only rudimentary.

Each of the eight limbs of the acarus sent by Mr. Crosse, was formed of seven joints, exclusive of the tarsus; a first, which is triangular and may be considered as the hip; a second and third, longer than the hip; a fourth, longer than the two preceding ones; a fifth, shorter than the fourth; a sixth and seventh, longer and thinner than the others, and the latter of which terminated by a small transparent tarsus, which appeared to us bi-lobed, and provided with a single claw bent underneath.

On the upper edge of the joints, with the exception of that forming the hip, were found one or two straight hairs.

Te real length of the body and head was half a millimeter.

The arachnide of Mr. Crosse appears to constitute anew species of the acarus race. The species described and figured, to which it nearest approaches, are those of cheese and meal, and perhaps more particularly the acarus dimidiatus of Hermann (Hermann, Mem. Apt. VI.4). It differs from the two first by the absence of the false corslet, by the two longest and most slender joints which precede the tarsus, the form of the body which is more oval, shorter and more bent, and finally by the numerous and long hairs which cover the whole of the back. It is distinguished from the acarus dimidiatus, which has a spherical body, with an appearance of corslet more colored than the rest of the abdomen, by the want o small short hairs which cover the surface of the eight appendicular limbs of the latter; but it approaches it by the numerous hairs which cover in rays the whole of the back.

Thus far we have strictly confined ourselves to natural history. We have observed, described, drawn, counted and measured all the constituent parts of this little animal. We have, by this means, proved that the small phial presented to the Academy by M. Robertson, contained the animicule or acarus spoke of; which also might be seen at a simple view as a whitish point.

We may now say something on the singular origin, and more on the singular fabrication of so

complicated an animal, although microscopic, so exalted on the organic scale, and whose structure, as we have seen, is composed of 1st a body; 2nd a head, formed of two lips, two jaws, two palpe, a sucker, a mouth and two eyes; 3rd a stomach and an anus; 4th two lateral pulmonary organs (The contraction of the animal, for some time immersed in alcohol, prevented us from distinctly seeing the eyes and pulmonary organs); 5th an ovary, containing eggs, ovary, containing eggs, in the female ones; 6th eight appendicular limbs, each composed of eight joints, including the tarsus; 7th a skin bristled with long and numerous hairs.

As we see it, we could scarcely increase the complication of this animal, though in addition to what we have just said, there are distinct sexes; among which there is a coupling and fecundation necessary for the reproduction of individuals of the species, and consequently we must admit that there are genital organs; and finally, the females make and lay eggs, whence the young ones are hatched, which at first have only six claws, until, changing their skin, they show two more, which were developed by degrees under this cutaneous skin.

Before attempting to make animals a complicated as the acarus, let us only try to create or obtain globules of Protospheries, and filaments of Protonemes; the two organic productions, which appear to us the most simple of the organic reign, which are the commencement of organization; and which mark the moment that matter globulizes and arranges itself, to serve the next instant for the formation or texture of different tissue masses of all other beings, whether vegetable or animal.

In these extremely simple globules or filaments, no interior granulation can be perceived, able to serve for their reproduction. Hence we may, perhaps, believe that these two sorts of beings, really elementary for those of a superior order, are organized productions, formed immediately from the matter. But who can assure us that these Protospheries and Protonemes do not contain reproductive globules, which escape the action of even our most powerful microscopes; or also, which will almost come to the same thing, who can say that these vegetables, so simple and a the same time so small, are not divided into particles immediately the life of association abandons them; so that each of the particles, animated with a new and independent life, becomes a sort of slip which reproduces the species, If these are only suppositions, they have at least the merit of being in perfect accordance with what everywhere takes place, besides these two single productions.

All our microscopic studies on organized beings, whether vegetable or animal, the smallest in their dimensions, as well as the simplest in their structure, have always shown us that their mode of reproduction was entirely submitted to the power of a similar mother which, alone, can, by placing her nutritive materials in space, conceal herself in a destined germ, by insulation, for the reproduction and maintenance of the species.

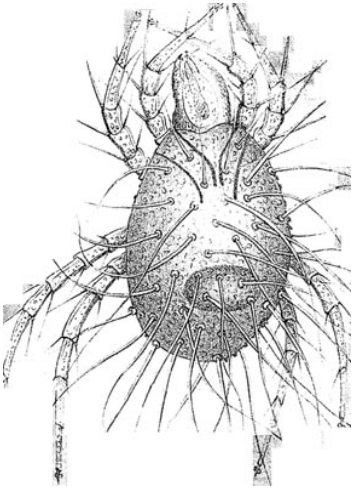
It is thus that, in proportion as we further study organized beings comparatively, and as we approach the smallest by the aid of the microscope, we see these numerous presumed spontaneous generations successively disappear, sprung from phantoms which could not support the light of a true and constant observation.

From our own knowledge, acquired by a long series of labors, in organization and physiology, we should say that the means which Mr. Crosse has employed, even supposing them in this case indispensable to the appearance of the animal, have only been simple stimulants, which, like those which excite and favor the germination of a grain of wheat, have hastened the hatching of the eggs, similar to those contained by the female individual sent by Mr. Crosse himself; eggs which were lain or brought on the surface of the Vesuvian stones used in the experiment.

Ignorant of the works written by Mr. Crosse, on the artificial and voluntary production of his acarus, we do not know whether the animal comes from the experiment in its most complete state, or whether, as would be more in accordance with the law presiding over the development of all organized beings, it passes through all the phases of developments and metamorphoses we so well know among all species of acarus. If, in the experiment, it begins by being only a point, then a

globule, then an egg, afterwards a young acarus, having as yet only six claws, and finally a perfect acarus with eight, male or female without eggs, or containing some like that in the figure which we have had the honor to show the Academy. But in this way of viewing the fabrication of Mr. Crosse's acarus, there would still remain a very great difficulty -- that of knowing where and how these animals, naturally so voracious, would find the nourishment necessary for their development; for organized beings can only increase in size and weight, by taking the nutritive matter which they find about them, and assimilating it themselves, by a mysterious power which belongs to them.

Plate X: The animal seen under the microscope ~



***British Association Report* (1855), page 9:**

"On the Existence of Acari in Mica"
by

Sir David Brewster

While examining with a microscope a thick plate of mica from Siberia, about 5 inches long and 3 inches wide, Sir David was surprised to observe the remains of minute animals, some the 70th of an inch, and others only the 150th of an inch in size. Some of these were enclosed in cavities, round which the films of mica were in optical contact. These acari were, of course, not fossil, but must have insinuated themselves through openings between the plates of mica, which afterwards closed over.