BIOLOGY

"A Classic of Science"---
Man's First Glimpse Of Microbes

"A thousand times smaller than the eye of a big louse" were the tiny animals seen through Leeuwenhoek's microscope.

Which ends were their heads, their feet, their tayls? The observations were duly recorded before the water containing them was "flung away" and the account sent to the Secretary of the Royal Society in London. Not for two hundred years was it suspected that they have any importance.

OBSERVATIONS, communicated to the Publisher by Mr. Antony van Leewenhoeck, in a Dutch Letter of the 9th of Octob. 1676. here English'd: Concerning little Animals by him observed in Rain- Well- Sea- and Snow-water; as also in water wherein Pepper had lain infused. In Philosophical Transactions [of the Royal Society] Vol. XII. For the Year of our Lord, M.DC.LXXXIII. Oxford, 1683.

IN THE YEAR 1675, I discover'd living creatures in Rain water, which had stood but few days in a new earthen pot, glased blew within. This invited me to view this water with great attention, especially those little animals appearing to me ten thousand times less than those represented by Mons. *Swamerdam,* and by him called *Water-fleas* or *Water-lice,* which may be perceived in the water with the naked eye.

The *first* sort by me discover'd in the said water, I divers times observed to consist of 5, 6, 7, or 8 clear globuls, without being able to discern any film that held them together, or contained them. When these *Animalcula* or living Atoms did move, they put forth two little horns, continually moving themselves: The place between these two horns was flat, though the rest of the body was roundish, sharpning a little towards the end, where they had a tayl, near four times the length of the whole body, of the thickness (by my microscope) of a Spiders-web; at the end of which appear'd a globul, of the bigness of one of those which made up the body; which tayl I could not perceive, even in very clear water, to be mov'd by them. These little creatures, if they chanced to light up on the least filament or string, or other such particle, of which there are many in water, especially after it hath stood some days, they stook intangled therein, extending their body in a long round, and striving to dis-intangle their tayl; whereby it came to pass, that their whole body lept back towards the globul of the tayl, which then rolled together Serpent-like, and after the manner of Copper- or Iron-wire that having been wound about a stick, and unwound again, retains those windings and turnings. This motion of extension and contraction continued a while; and I have seen several hundreds of these poor creatures, within the space of a grain of gross sand, lye fast cluster'd together in a few filaments.

I also discover'd a *second* sort, the figure of which was oval; and I imagined their head to stand on the sharp end. These were a little bigger than the former. The inferior part of their body is flat, furnished with divers incredibly thin feet, which moved very nimbly, and which I was not able to discern till after several Observations. The upper part of the body was round, and had within, 8, 10, or 12 globuls, where they were very clear These little Animals did sometimes change their figure into a perfect round, especially when they came to lye on any dry place. Their body was also very flexible; for as soon as they hit against any the smallest fibre or string, their body was bent in, which bending presently also yerked out again. When I put any of them on a dry place, I observ'd, that changing themselves into a round, their body was raised pyramidal-wise with an extant point in the middle, and having lain thus a little while with a motion of their feet, they burst asunder, and the globuls were presently diffus'd and dissipated, so that I could not discern the least thing of any film, in which the globuls had doubtless been inclosed: And at this time of their bursting asunder I was able to discover more globuls than when they were alive.

But then I observ'd a third sort of little Animals, that were twice as long as broad, and to me eye yet eight times smaller than the first. Yet for all this, I thought I discern'd little feet, whereby they moved very briskly, both in a round and streight line.

There was, further, a *fourth* sort, which were so small, that I was not able to give them any figure at all. These were a thousand times smaller than the eye of a big Louse: For I judge, the *axis* of the eye of such a Louse to be more than ten times as long as the axis of any of the said little

HOW GEYSERS WORK

Solved by Bunsen, the flame chemist, on his vacation in

ICELAND

Next Week's Classic of Science, The 138th Classic

creatures. These exceeded all the former in celerity. I have often observ'd them to stand still as 'twere upon a point, and then turn themselves about with that swiftness, as we see a Top turn round, the circumference they made being no bigger than that of a small grain of Sand; and then extending themselves streight forward, and by and by lying in a bending posture

I discover'd also several other sorts of Animals, but these were very big respectively; of which I intend not to speak here; only this, that they were generally made up of such soft parts, as the former, they bursting asunder as soon as they came to want water.

Observ. II.

The 26. *May,* it rained hard; the rain growing less, I caused some of that Rain-water, running down from the house-top, to be gather'd in a clean Glass, after it had been washed two or three times with the water. And in this I observ'd some few very little living creatures, and seeing them, I thought they might have been produced in the leaden-gutters in some water, that had there remain'd before.

Observ. III

On the same day, the Rain continuing, I took a great Porcelain-dish, and exposed it to the free Air upon a wooden vessel, about a foot and a half high, that so no earthy parts, from the falling of the Rain-water upon that place, might be spatter'd or dashed into the said dish. With the first water that fell into the dish, I washed it very clean, and then flung the water away, and receiv'd fresh into it, but could discern no living creatures therein; only I saw many irregular terrestrial parts in the same.

The 30. of *May,* after I had, ever since the 26*th,* observ'd every day twice or thrice the same Rain-water, I now discover'd some, yet very few, exceeding little Animals, which were very clear.

The 31*th* of *May,* I perceived in the same water more of those Animals, as also some that were somewhat bigger. And I imagine, that many thousands of these little Creatures do not equal an ordinary grain of Sand in bigness: And comparing them with a Cheese-mite (which may be seen to move with the naked eye) I make the proportion of one of these small Water-creatures to a Cheese-mite, to be like that of a Bee to a Horse: For, the circumference of one of these little Animals in water, is not so big as the thickness of hair in a Cheese-mite.

Observ. IV.

June 9th, having received, early in the morning, some Rain-water in a dish, as before, and poured it into a very clean Wine-glass, and exposed it about 8 of the clock in the morning to the Air, about the height of the third story of my house, to find, whether the little Animals would appear the sooner in the water, thus standing in the Air:

Observing the same accordingly the 10*th* of *June,* I imagin'd, I saw some living creatures therein; but because they seem'd to be but very few in number, nor were plainly discernable, I had no mind to trust to this observation.

The 11*th* of the same month, seeing this water move in the Glass from a stiff gale of wind (which had blown for 36 hours without intermission, accompanied with a cold, that I could very well endure my Winter-cloaths.) I did not think, I should then perceive any living creatures therein; yet viewing it attentively, I did, with admiration, observe a thousand of them in one drop of water, which were of the smallest sort, that I had seen hitherto.

The 12*th* of *June,* the wind being at west, the Sun shining with interloping clouds, I view the same Rain water, and found the fore mention'd little Animals so plentifully in the water which I took up from the sirface, that one or two thousand, in one single drop did not make up their number.

The 13*th* of the same month, viewing the same water again, I found, besides the Animals already noted, a sort of creatures, that were eight times as big as they, of almost a round figure: And as those very small *animalcula* did swim gently among one another, moving like as Gnats do in the Air; so did these bigger ones move far more swiftly, tumbling round as 'twere, and then making a sudden downfall.

The 14*th* of *June* I did find these very little creatures in no smaller number. The 16*th,* I saw them as before; and this water, which had been, in all, 1/6 of a pint, being now more than half dryed up, I flung it away. . . .

Observ. VI.

The 17*th* of this month of *June* it rained very hard; and I catched some of that Rain-water in a new Porcelain dish, which had never been used before, but found no living creatures at all in it, but many terrestrial particles, and, among others, such as I thought came from the smoak of Smiths coals, and some thin thrids, ten times thinner than the thrid of a Silk worm, which seem'd

to be made up of globuls; and where they lay thick upon one another, they had a green colour.

The *26th,* having been eight days out of Town, and kept my Study shut up close, when I was come home and did view the said water, I perceived several *animalcula,* that were very small. And herewith I desisted from making at this time any further Observations of Rain-water.

Mean time, this Town of *Delft* being very rich in water, and we receiving from the River of *Maase* fresh water, which maketh our water very good; I viewed this water divers times, and saw extream small creatures in it, of different kinds and colours; and even so small, that I could very hardly discern their figures: But some were much bigger, the describing of whose motion and shape would be too tedious: This only I must mention here, that the number of them in this water was far less than that of those, found in Rain-water; for if I saw a matter of 25 of them in one drop of this Town water, that was much.

In the open Court of my house I have a well, which is about 15 foot deep, before one comes to the water. It is encompassed with high walls, so that the Sun, though in Cancer, yet can hardly shine much upon it. This water comes out of the ground, which is sandy, with such a power, that when I have laboured to empty the well, I could not so do it but there remained ever a foots depth of water in it. This water is in Summer time so cold, that you cannot possibly endure your hand in it for any reasonable time. Not thinking at all to meet with any living creatures in it, (it being of a good taste and clear) looking upon it in *Sept.* of the last year, I discover'd in it a great number of living animals very small, that were exceeding clear, and a little bigger than the smallest of all that I ever saw; and I think, that in a grain weight of this water there was above 500 of these creatures, which were very quiet and without motion.

In the Winter I perceived none of these little animals, nor have I seen any of them this year before the month of *July,* and then they appear'd not very numerous, but in the month of *August* I saw them in great plenty.

Science News Letter, October 18, 1930

ANTHROPOLOGY

If Elected, You Must Serve Old Tzapotic Democracy

AN INDIAN democracy, in which officials serve without pay and are deprived of their citizenship if they refuse political office, has been discovered among an isolated tribe, the Tzapotecs of Mexico, by Dr. Oscar Schmieder, of the University of California.

The Tzapotec system of government by and for the people appears to be one of the oldest democracies in the world. Magnificent stone buildings erected by early generations of Tzapotecs were falling into ruins when Columbus discovered America. Yet the customs of the tribe have changed very little, owing to their secluded home in the high valley of Tlacolula.

Mitla, chief town of the Tzapotecs, holds elections January first and chooses its officials for one year. To refuse to serve is literally to become a man without a country. Married men over 18 may vote, but bachelors cannot vote until they are 21.

The young men take turns serving on the police force, for two weeks at a stretch. All contribute labor for building schools and other public works. A man arrested for drunkenness must work out his fine.

When a young Tzapotec decides which of the village maidens he wishes to marry, he goes, not to the girl or to her parents, but to a professional matchmaker who arranges the marriage to the satisfaction of all concerned.

Each family has a plot of arable land. The communities also own isolated patches of ground in the mountains which any one may farm.

While farming is the chief occupation and corn and beans the staple crops, the men weave woolen blankets or serapes on ancient looms and make long trips to the cities to sell their products.

The women may help their husbands in the fields but their chief work is in the house, or its small garden and orchard.

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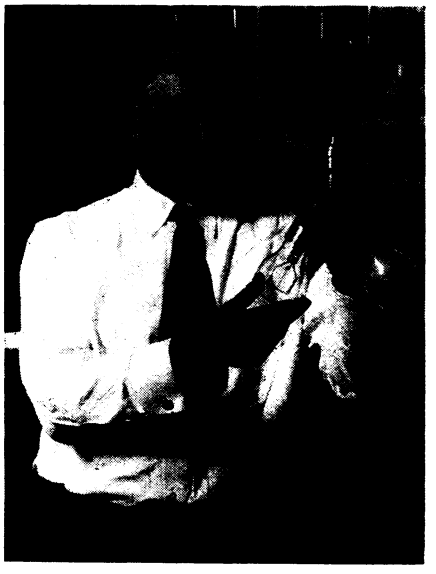

DR. J. W. MARDEN

And his new sun lamp developed in the laboratories of the Westinghouse Company. It can be adapted for use in an ordinary electric light socket.

ENGINEERING

New Sun Lamp Resembles Ordinary Electric Light

SUNLIGHT has become almost as easy to reproduce as the artificial illumination of the electric lamp. This is made possible by a new type of lamp which, although it closely resembles the common lamp and is almost as readily used, gives light as beneficial as that from a midsummer sun. It was described in Richmond, Va., by Dr. J. W. Marden, research engineer of the Westinghouse Company, before the annual meeting of the Illuminating Engineering Society.

"This new lamp," Dr. Marden said, "is designed to send out small quantities of healthful ultraviolet rays when it is burned in conjunction with an ordinary electric lamp or a small resistance. Consuming only 25 watts, it produces a very mild sunburn or redness of the skin on one's arm held about five inches from the lamp for a period of about 15 or 20 minutes."

The lamp is of the low pressure mercury glow discharge type and will soon burn out if full house voltage, usually 110 volts in the United States, is applied to it. Hence a transformer, a special resistance or another lamp must be used with it. It is thought that its most convenient application in the home will be in a double socket with an ordinary illuminating lamp.

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