and union are perfect without the danger of abscesses from strangulation of tissue. Since I have practiced the following method I prefer it to any other, and the results have been beautiful. I use the kangaroo tendon, and with a straight or curved needle begin at the lower angle of the wound and close the peritoneum with a running stitch. The deep fascia is next closed in the same way, and then the superficial fascia and fat; the suture is now cut and the end buried in the tissue. The skin is united by superficial silkworm gut sutures introduced with a small curved needle. The suturing by the tendon may be done in one minute, and the silkworm gut may be quickly introduced and tied. I prefer the tendon to catgut because it is more easily made aseptic, and will not be absorbed until union is perfect, and I use the silkworm gut because it is one of the most aseptic sutures, as has been recently emphasized by the results of the bacteriological examinations of sutures removed at the Johns Hopkins Hospital. Only one piece of tendon is used in suturing an average abdominal incision. The silkworm gut may be removed on the fifth or sixth day, and the surface will be dry and union perfect. But the buried tendon will hold the surfaces together for two or three weeks before its integrity is so impaired as to destroy its resisting power. I do not now expect to be annoyed by stitch or mural abscesses, or ventral hernia. Dr. Gill Wylie, and a few other operators, suture the fascia separately with catgut, but the sutures tied on the surface over the incision are introduced through all the thickness of the wall. Dr. H. O. Marcy closes the wound with the buried tendon and uses no superficial suture. His technique is beautiful and his results perfect, but the time required to close the abdomen is too long in the practice of the average abdominal surgeon. He has done more to popularize the tendon as a buried suture than any other man, and the results of his work in this line are invaluable.

THE BATTLE WITH GERMS.

Read at the meeting of the Ohio State Medical Society, May 4, 1892.

BY JULIA W. CARPENTER, M.D.,
OF CINCINNATI.

Knowledge of the cause of infectious diseases is considered one of the achievements of the present day. Chemistry and the microscope, wielded by indefatigable energy, have brought to light some of the little things that confound the mighty. These microscopic travelers have been traced in their wanderings through the labyrinths of the human body and their manner of warfare studied.

It has been shown that when these microorganisms enter the body those that are not cast out of the system, are attacked by the white blood corpuscles and other wandering cells called phagocytes. These cells take the parasites into their interior, where they are killed and disintegrated. The destruction of the bacteria in the cells is a *chemical* process. In fatal cases the bacteria poison the cells that engulf them; or when the infection is overwhelming, there is no battle at all, it is simply a surrender at sight.

Again it has been shown that fresh blood, serum, tissue juice and saliva have germicide properties, but not to an unlimited degree. The saliva will destroy the typhoid and cholera bacillus if they are not too numerous. The diphtheria bacillus and pneumococcus are not veiled, but lose their virulence.

The destruction of the bacteria by the fluids of the body is also a chemical process. The first, called the phagocytic theory, and the second called the chemical theory do not conflict. The first is a chemical process inside the cell, the other a chemical process outside the cell, but the fluids of the body contain the secretions of cells.

These are the methods of the destruction of germs in the body, but the reason why the cells win the battle in one case and lose it in another, cannot be demonstrated with our present microscopes and chemical tests. It depends on a yet unknown something, called for convenience vital force, of which some persons have more, some less. The highest degree of vital force which gives resistance to disease is called natural immunity. This is seen when many are exposed to a poison, as small-pox or diphtheria. All do not take the disease, some have the normal vital power that offers the necessary resistance. Living tissue in a healthy state can destroy septic bacteria. If this were not so every one would have tuberculosis, for no one escapes breathing, at some time, air full of the tubercle bacilli. It is when the vitality of the body is lowered that that certain something is wanting that can destroy microorganisms. The vital force of the cells is the protecting power.

To prevent the inroads of infectious diseases there are only two ways, one pertaining to germs and one to the individuals. As to the germs, they must either be destroyed outside the body or forced to keep at a respectful distance. As to individuals they must cultivate the vital power that gives immunity. Can either of these things be done?

As to the first, are there any ways to destroy germs outside of the body, available for every day life for every one? What say the indefatigable workers in the field of bacteriology? They tell us that one of the most powerful destroyers of bacterial life is—*sunshine*. For instance, speaking of one of the most virulent of germs, the bacillus of anthrax, supposed to live in the soil, they say the anthrax spores are so tenacious of life, so resistant, that nothing in the soil can destroy them, only *sunshine on the surface*.

The little tubercle bacillus, a microscopic line, the dreadful scourge, that carries off more than any other one disease, the little rod that calls together the learned from all parts of the earth in great convention, what statements do bacteriologists make about this monarch? The following: "The tubercle bacillus, very tenacious of life, is found alive after being buried long in the earth, or even after exposure to ordinary weather, but is killed after *long exposure to sunlight*." Are the rooms of consumptives flooded with sunlight for the protection of others, or is the sun shut out to save the carpet? The subject of sunshine as a germicide for every day life has not been emphasized, but medicinal germicides have been advertised the world over.

Can vital force be cultivated? Without sunshine and fresh air, never. Sunshine, besides being antagonistic to germs, has a wonderful influence on the body, imparting the deficient vital power by a process as unknown as the vital force itself. The human body as well as the vegetable world utilizes sunlight. The whiteness of the plant grown in the cellar, and the green color of the same thing grown in the light, have their counterparts in human beings. Just what is the influence of sunlight on nutrition and nerve force we have no methods at present of estimating,

but enough is known to induce physicians to warn people against shutting the sunlight out of their homes for the double reason, that it gives vital force to people and takes it away from germs.

Is the warning needed? Sunlight is shut out of every home as if it were the germs themselves. Take a drive through the suburbs of any city, a sunny winter morning when a little sun, a warm hearted visitor, should receive a hearty welcome. Every window toward the sun is closed by shutters, shades and curtains, usually all three. If uncovered at all a square foot is the most. Whether palace or hovel the sun is barred out in all alike. Please notice if you have not already done so.

Plants with infallible instinct turn to the sun, man with fallible reason turns away from it.

Another forgotten requisite to vital power is fresh air. The best way to prove its necessity is to look at the effects of vitiated air. The carbonic acid from the lungs and the emanations from the body soon make the air unfit to breathe. As it gets to this point it causes languor, headache, an oppressed feeling and various uneasy sensations. An eminent physiologist very accurately says: "It is a wonderful fact that the body after a time adapts itself to such vitiated air and that one soon can breathe, without apparent inconvenience, an atmosphere which, when one first entered it, felt intolerable. Such an adaptation, however, can only take place at the expense of a depression of all the vital functions, which must be injurious if long continued or often repeated." The proof of adaptation is well shown by the experiments of Claude Bernard. A sparrow is placed under a bell glass of such a size that it will live for three hours. If, at the end of the second hour (when it would have lived another hour) it be taken out and a fresh healthy sparrow put in, the fresh healthy sparrow will die instantly. The condition of the sparrow, at the end of the first hour, is the state of most persons, and where is the resistance to invading bacteria?

There is a growing dread of air that is most remarkable. People are actually afraid of it. It shows itself on all sides. If a street car is packed, and one, near the door, opens it, it is as quickly closed by another; and until it is actual summer, if one opens a window, all frown and move away as if it were a leper. Steam cars are no better. Returning in the early spring from a neighboring town, though the temperature was 55° F., each ventilator and window was closed and the stove red hot. As no one was nearer than five seats I ventured to open my window. In five minutes the conductor approached saying, "I must shut the window, they are complaining of the air." With one window open in the whole car a draught was not possible. A fish might as well be afraid of water as people of air.

Look at the latest luxury, so-called, in cars, the vestibule train, all closed up so the whole train is like one long car. In the ordinary car there is now and then a puff of fresh air from the door, now it is a puff from the next car no fresher than your own. What is this atmosphere in which one is shut up for twenty-four hours? Was there ever a car filled with only healthy people? The breath from the healthiest is refuse material, and to this is added the breath from some that have catarrh, dyspepsia, imperfect teeth, incipient phthisis, and the breath from various other invalids traveling for health. Some smoke

is also mixed with this, as the smoking room being small the door is usually open. Opening one's own window cannot destroy this mixture and inhaling it twenty-four hours puts one's vitality at least as low as that of the sparrow at the end of the first hour, and resistance to the germs inhaled cannot be expected.

People often say they took cold traveling. They had an influenza from the germs they inhaled and could not resist.

What about ventilation at night? The exchange of carbonic acid and oxygen in the lungs is not the same during sleep as when awake. More oxygen is taken in during sleep and stored up for use the next day, but how many give themselves more air at night than in the daytime?

A few months ago there was published in one of our journals a statement from some French physician as to a new treatment for phthisis which had brought about wonderfully good results. The new treatment was simply leaving the windows of the sleeping rooms partly open at night. This is amusing in the light of to-day, but as it is the national custom in France to keep all the windows closed at night for fear, as they say, of sore eyes, it was not so strange that he was amazed at the good effect of fresh air at night.

Physicians are by no means without blame in their example as to air. Many ride in close carriages shut up almost the same in sunshine as in storm. In their assembly rooms one might often suppose they were solving the problem as to how long they could breathe the same air over and over and the discussions still continue rational.

There are some physicians, however, in our city, who have the courage to use out door air as an aid to treatment in some acute diseases, as pneumonia, and have all the windows open. Of course the result is good.

There ought to be a National Department of Health, and one of the chief duties should be to protect people as far as possible from all these so-called pathogenic organisms. And until people have the knowledge to protect themselves, they should be protected by law. For instance, garments that have wiped up the unspeakable infectious dust of the streets should not be allowed in any church, theatre, school or any assembly room. Of course persons have the right to stir up such an atmosphere and breathe it if they wish, but they have no right to subject another to it. Dreadful mistakes are made from lack of knowledge. The law of absolute cleanliness holds good outside of surgery. The results of Listerism are needed in more than one department.

Architects should be taught the laws of health so they will not turn beautiful homes into hospitals. Whether they need this instruction or not, look at one house, which is only a sample of many. There it stands alone in the centre of a large lot, facing the east, so the whole length of the house has the southern exposure so poetically described by novelists. But what is there on this sunny, airy side of the house? All the halls and numerous closets. On the north, where there is no sun, are all the rooms and bay windows. Windows toward the east catch the morning sun except those on the first floor. No ray of sunshine ever enters there. It is barred out by a porch with a roof so wide and slanting so low that the sun never stoops low enough to peep in. We speak of the coffin lid crystals of the triple phosphates; the term might well be applied to this kind

of a porch roof. If the house could be turned around, the north side on the south, it would be a model.

We have a fine government building occupying half a block. There are large windows, large corridors, but most of the work is done in the interior by gaslight.

Architects are not taught that sunlight and fresh air are germicides, and opposed to phthisis, diphtheria, etc., and so they cannot be blamed. In the meantime, however, they go on making the windows smaller and smaller, and the third story of homes almost without the possibility of ventilation.

If the laws of nature cannot be changed, why not follow them? The foundation laws of health are as ignored as if they were yet to be discovered. That sunlight and air are man's best friends one little dreams. The life of to-day is a cultivated one contrary to nature. It brings about a lowered vitality and susceptibility to the so-called pathogenic microorganisms, for germs can not attack actively growing tissues, they can not affect man unless the tissues have been previously injured.

If the normal vital force gives immunity from these infectious diseases, and its lack gives susceptibility, instead of saying some germs are pathogenic to man, would it not be more correct to say, it is *man* that is so often pathogenic and not the germs.

THE ESOTERIC BEAUTY AND UTILITY OF THE MICROSCOPE.

BY EPHRAIM CUTTER, LL.D., M.D.,
OF NEW YORK.

FIGURE 1.—A. *Asthmatos Ciliaris*, mature form.
B. *Asthmatos Ciliaris*, with inside young.
C. *Asthmatos Ciliaris*, mature form, the budding process going on.
Patient of E. Cutter.

FIGURE 2.—A. Deformed Ciliate Epithelium from Air Passages in La Grippe.
B. Another specimen without Cilia. Patient of E. Cutter.

IV.

ASTHMATOS CILIARIS AND GRIP.

Epidemic influenza, or grip, is not a new disease.

To repeat, I am grateful to American microscopy for views of grip which are positive and tangible. One was once accused of jumping to conclusions too quickly and without sufficient investigation, and told that if he had an idea he ought to stick to it, develop it, and not sacrifice himself. Let us learn from critics and take a jump of fifteen years backwards to an observation. Fifteen years is not a too quick jump to make, and must be safe.

June 20, 1877, I was in Cleveland, Ohio, studying the causes of disease with Dr. Salisbury. He had the grip, and showed me, under the microscope, in his excretions from the air passages (a), a dead infusorium he called *asthmatos*, and mentioned in Kent's *Infusoria*, page 466, and the *Micrographic Dictionary*, 1883, as a genus of cilio-flagellate infusoria. "*Characters*: free, rounded, with an anterior bundle of cilia and flagelli-form filament. *Asthmatos ciliaris*, length 1-1200 (Salisbury);" (b) a living, lively and mature specimen that died under our sight; (c) several young ones which were globar, provided with beautiful cilia, whose motions were as follows: 1. Some rotated on their own axes, because of the graceful waving backwards and forwards of the cilia moving together like flails beat in unison as to time and direction. 2. Some, where the wave motion of the bodies were less than the wave motion of the cilia. 3. Some had a non-synchronous movement of cilia; that is, while one cilium waved to the right, another was waving to the left, and so on. In other words the cilia did not move together, but were independent, and moved asymmetrically.

The cilia were not arranged in straight lines, or rows, side by side, but were planted as trees come up on a conical or rounded hill, or whiskers on the chin.

Size was on an average about that of the oval mucous corpuscles which show the so-called Brunonian movements.

The cilia were as long and longer than the diameter of the globar body. Dr. S. spoke doubtfully of them, and was not sure of them until the microscope revealed a few of them in the field. He said that sometimes the field is full of them in full activity, and so I have found them.

Since this observation, many others have been made and published confirming it. The following additional motions have been observed.

a. A specimen has been seen to turn completely over, so that the cilia faced in the opposite direction, and then to turn back again to their original position.

b. They have been observed to bud.

c. To divide by fissure.

d. To have a parturition of a young one, which moved from one side of the mother to the opposite, and then issued a new being.

e. A bud of about one-quarter the diameter of the mother would pull off, taking with it a filament of the parent substance, so that mother and young were connected as with an umbilical cord.

They would continue to separate more and more, the filament or gubernaculum growing more and more attenuated until it broke.

The part attached to the mother was drawn into it. They separated as if forced apart by some one as candy is pulled by a confectioner.

Prof. Paulus F. Reinsch, of Erlangen, Germany, saw this phenomenon with me, and said it was a new observation in genesis.

f. Besides these, the *asthmatos* locomote some-