

**Selections from essays on health-culture and the sanitary woolen system /
by Gustav Jaeger ... (Tr. from the German.).**

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AND

The Sanitary Woolen System.

G. JAEGER, M.D.

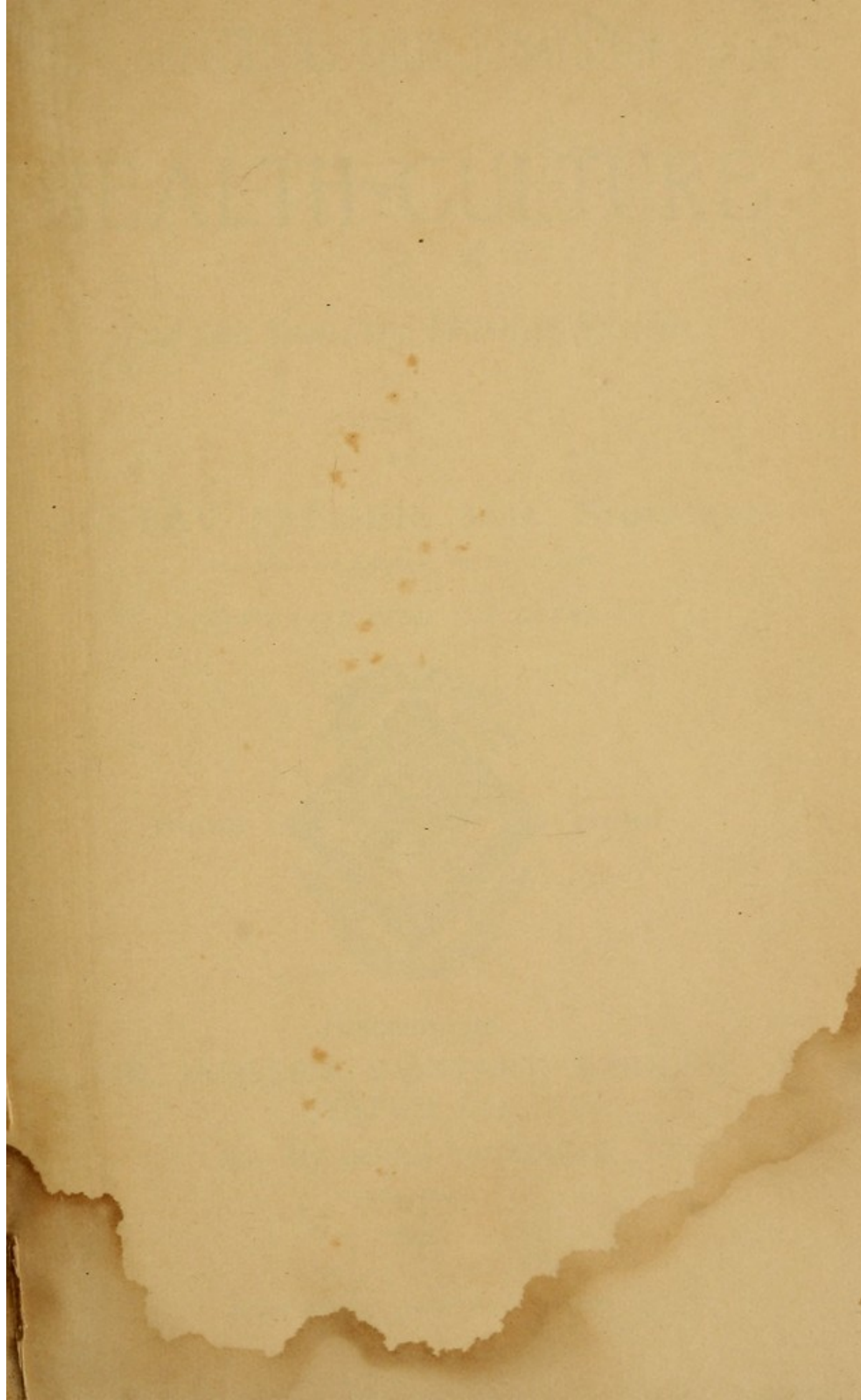
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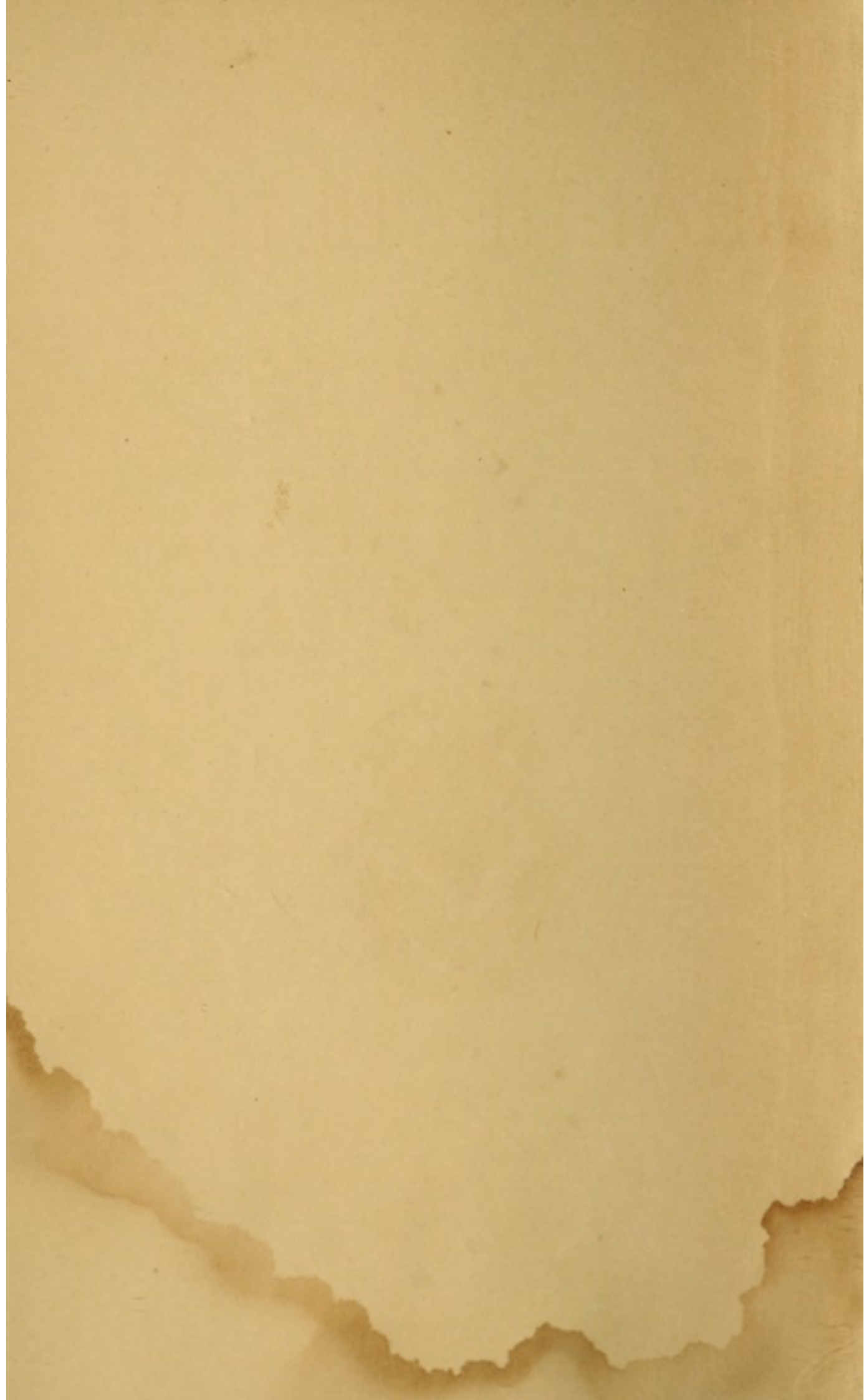
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SELECTIONS FROM ESSAYS ON
HEALTH-CULTURE

And the Sanitary Woolen System,

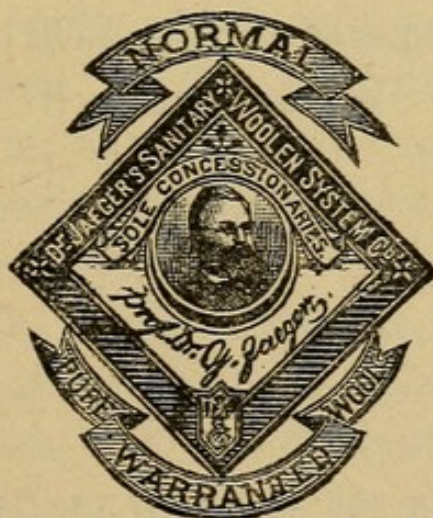
BY

GUSTAV JAEGER, M.D., STUTTGART,

PROFESSOR OF ZOÖLOGY AND PHYSIOLOGY.

(TRANSLATED FROM THE GERMAN.)

TRADE



MARK.

PUBLISHED BY
DR. JAEGER'S SANITARY WOOLEN
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Nos. 827 AND 829 BROADWAY,
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1891.

Second Edition, revised and enlarged,

"The first Wealth is Health."

—EMERSON.

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PREFACE.

BY THE AMERICAN EDITOR.

THE proprietors of Dr. Gustav Jaeger's Sanitary Woolen System, have met with so unexampled success in introducing it into England and on the Continent, during the four years in which it has been on trial there, that they feel confident of having an improved system of Sanatory Clothing to offer to the American people which will not only meet the necessities incident to the conditions of the North American climate, but will also supply a want long felt and intelligently realized by a large portion of this great community.

A people fertile in the invention of devices, and in the contrivance of means for meeting the exigencies of a varied climate, and the demands of an advanced stage of civilization, will not be slow to appreciate the merits, and avail themselves of the benefits of the inventions and discoveries of their transatlantic neighbors. This Sanitary System of Clothing appeals at once to the American practical common sense, and will undoubtedly find a hearty welcome and a speedy adoption.

It is in this conviction that arrangements have been made for opening a spacious wholesale and retail mercantile establishment in New York; and it is

with a view to enlightening the public as to the scientific claims of the New System, that the substance of Dr. Jaeger's European publications have been compiled, with but the fewest and slightest modifications, in his own popular language, and offered to American readers in this compact, but comprehensive and intelligible form.

Dr. Jaeger's own preface is presented with this. The cordial indorsement of Dr. Jaeger's Sanitary System, by some of the most eminent physicians of England and the Continent, will surely commend it to a fair hearing and the candid consideration of the Public.

NEW YORK, 1886.

PREFACE.

THE scientific and technical discussion of my researches in the direction of Health-culture, will be found in works previously published by me on allied topics, such as *Die menschliche Arbeitskraft* (Munich : R. Oldenburg, 1878), *Seuchenfestigkeit und Konstitutionskraft* (Leipzig : Ernst Günther, 1878), and *Die Entdeckung der Seele* (Leipzig : Ernst Günther, 1880). In writing the essays contained in this volume, I have aimed at the practical application and diffusion of my views, and have consequently striven to adopt the plainest mode of popular exposition. Next to the soundness of my sanitary doctrines—which, indeed, will speak for themselves at once upon trial—I am chiefly indebted to the popular form of my compositions for the extraordinary rapidity, assuredly unsurpassed in its way, with which the Sanitary Woolen System has borne down every obstruction.

I am anxious here to caution my readers, beforehand, against erroneous impressions with respect to the Sanitary Woolen System. Dress has hitherto been generally regarded as a means of protection to the body merely. This restricted view is correct when clothing is manufactured partly from vegetable and partly from animal fibres ; but it falls far short of the whole truth, when applied to the Sanitary Woolen Clothing. The latter supplies a decidedly nearer perfect and more effectual protection than

is afforded by ordinary "mixed" clothing; it has, moreover, the most important effect of rendering the body *hardy*. This operation is gradual but certain. The wearer is not at once made proof against influences of weather, infection, etc.; various disturbances of health may occur, but their short duration will be proof that the right course has been taken to secure "a sound mind in a sound body."

Perceiving the difficulty of inducing any considerable portion of the public to adopt a reformed System of clothing, unless practically aided by a supply of garments made in accordance with my System, I have made arrangements for the manufacture of such garments, under my supervision and control.

With the experience obtained of the vitiation of woolen fabrics by the admixture of cotton, and in view of the *unreadiness* with which manufacturers and tradesmen at first took up the matter, I feel satisfied that by adopting this practical course I greatly assisted the extension of the reform. In the Sanitary Woolen System, woolen fabrics adulterated by the addition of vegetable fibre, bear to the genuine article a relation analogous to that which wine, tainted with fusel-oil, bears to pure wine, because the cotton threads fix and retain the "noxious" emanations corresponding to the vapors of fusel-oil. If, therefore, for the sake of a possible saving in price or on the score of convenience, people are induced to deal in doubtful quarters, and to forego the advantage of thorough investigation, I beg that any untoward experience may not be laid to the charge of the System.

G. JAEGER.

STUTTGART.

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SUMMARY
OF
DR. GUSTAV JAEGER'S
CLOTHING REFORM
AND
SANITARY WOOLEN SYSTEM.

THE, INDISPUTABLY, PERNICIOUS EFFECTS, upon health, due to the material and form of the ordinary clothing of the present day, were hardly suspected until Dr. GUSTAV JAEGER, of Stuttgart, began to publish the results of his investigation on the subject.

This distinguished German physician has established the fact, that most bodily derangements may be prevented or cured, or greatly alleviated, by the adoption of proper clothing; and he has constructed a system based on the principle of pure, animal fibre, for clothing and bedding. This is known as "DR. JAEGER'S SANITARY WOOLEN SYSTEM." It affords to the body the greatest protection against Cold, Heat and Dampness, with the least obstruction to the body's exhalations. These conditions are in-

stinctively felt to be better fulfilled by woollen, than by linen or cotton fabrics. Hence the very general use of flannel garments by athletes and by members of cricket, boating, and other sporting clubs, who are called upon to engage in vigorous, physical exercise likely to cause profuse perspiration, which is simply an intensification of the action of the skin, incessantly going on, with more or less activity, and ceasing only with life itself. Dr. Jaeger reasons as follows: If this action of the skin be imperfect, impeded, or repressed by any cause, fat and water accumulate in the tissues, the functional powers of which are lowered and weakened; and the flesh, which should feel elastic, firm and hard, becomes soft and flabby, resulting in a general derangement of the physical organization; and the evil effect on the body is experienced in the form of many disorders which are erroneously considered to be more or less inevitable and ineradicable,—such as corpulence, asthma, pulmonary complaints, diseases of the digestive organs, gout, rheumatism, etc.

All fabrics manufactured of, or adulterated with, vegetable fibre, (linen or cotton,) or silk, are impervious to the body's exhalations, which are arrested and turned to water on the skin, if, at any point underclothing or lining of such fibre, intervene, between the body and the outer atmosphere. Linen and cotton are, moreover, good conductors of heat, and thus, especially when damp, readily cause a chill. Further, *dead* vegetable fibre has the same property that the living plant has, of absorbing noxious gases; but it cannot, like the plant, digest or assimilate them.

In view, therefore, of the importance of maintaining a healthy and normal action of the skin, not only for persons of active habits and pursuits, but especially for those engaged in sedentary occupations, Dr. Jaeger selects Animal wool as the proper substance for his "Sanatory Clothing," and *rejects all linen, cotton and silk for underwear and for bedding*, as obstructive of the natural processes of absorption and evaporation. The advantages of this material seem obvious, as, when woven into tissues, wool possesses above all textile fabrics—

1. *A peculiar power of absorption and transmission;*

2. *The properties of a non-conductor of heat—so essential to the preservation of an equable temperature of the body;*

3. *The property of promoting the elimination, from the tissues, of all excess of fat and water, thus making the flesh firm, and hardening and toughening the muscles.*

As hitherto woven, woolen fabrics are objectionable to many, because they irritate the skin and cause a feeling of intense discomfort, by preventing the proper escape of the exudations of the skin; and, as a rule, they are so heavy as to be intolerable for summer wear. To remove these objectionable features, and to make woolen clothing truly sanatory, and suitable for all seasons—protecting from oppressive heat in summer and maintaining a proper degree of warmth in winter—Dr. Jaeger has materially modified the usual processes of weaving woolen fabrics, and adopted a method which produces a much less closely-woven texture than the ordinary flannel;

and all underwear for ladies, gentlemen and children, is made of "Stockinet," undyed or natural gray, very porous, agreeable and durable.

From these conditions, together with the conformity in construction of the garments, to the human anatomy, arise what Dr. Jaeger specifically claims as

THE SANITARY ADVANTAGES OF PURE ANIMAL WOOL.

I. Wool "gently stimulates the skin;" *i. e.*, to that degree necessary to excite and maintain its normal activity in secreting and extruding the waste matter, and surplus fat and water of the body.

II. Wool, relatively to linen and cotton, is a non-conductor of heat and electricity, and, therefore, tends to preserve to the animal body its normal measure of these vital energies.

III. Wool, woven and made up according to the Jaeger methods, by reason of its permeability to moisture, (the vaporous exhalations of the skin,) promotes the elimination of the effete matters, and the reduction of the abnormal or excessive heat of the animal body; and this is the reason why *the body, even when freely perspiring, remains dry in woollen clothing*, while in linen or cotton, it becomes wet—a fact of common experience with all who engage in athletic exercises.

IV. Wool thus co-operates with the skin to regulate, by its exhalations, the temperature of the body, the wool supplementing the efforts of the skin to dispose of excess of heat, whether proceeding from in-

ternal or external sources, thus maintaining that equable state which is the true condition of health and comfort. Hence it is, that wool is better than linen or cotton as a preventive of the overheating of the blood, through internal heat; and that woollen clothing is less oppressively hot than linen or cotton in summer, and, therefore, more agreeable and healthful in the hottest climates.

V. Wool is electrical, while linen and cotton are not; *i. e.*, wool generates electricity, but does not conduct it. It follows, therefore, that a body clothed in wool loses less of its animal electricity, while fresh electricity is produced on the surface. Most people are familiar with the facility with which the human body conducts electricity. Cotton ranks next to it as a conductor, while wool is classed with non-conductors and insulators, and, for that reason, is called an electric, or generator of electricity. When the air is clear and dry, place a person upon a stool or chair, the legs of which are supported from the floor by glass tumblers, and beat him gently on the back with a woollen or camel-hair shawl, and sparks may be drawn from his nose, or fingers, from one-fourth to three-fourths of an inch long—or large enough to light the gas of a burner, or to charge a Leyden jar. Probably every reader has seen and heard electric sparks on withdrawing a woollen stocking—never from taking off a cotton one. There is no manifest electricity, in the latter case, because the cotton fibre conducts it away—dissipates it.

The Sanitary Woollen System is, therefore, salutary for those whose bodies are deficient in animal heat or electricity. With persons leading sedentary lives,

the action of the skin is deficient, and it requires the stimulating aid of the woolen clothing, which materially assists in eliminating from the tissues the excess of water and fatty matter always tending to accumulate when insufficient exercise is taken.

Chills caused by draughts, or colds, damp clothes or bedding, are very dangerous, because the sudden suppression of the cutaneous exudations, interferes with the circulation of the blood, thus disturbing the action of the lungs, the liver, the stomach, etc., and setting up conditions favorable to inflammation and fever.

Their *modus operandi* may be summarized as follows:

The exhalations which are "mal-odorous" and noxious by reason of defective excretory action, are generated in the body during and after the digestion of food, during all vital action in fact, or when the body is invaded by disease, or the mind is at work, or disturbed by worry, gloom, anger or fear, or indeed by any violent passion or strong emotion. For every act of mind or body, is attended with destruction of tissue, constituting so much waste matter, which becomes poisonous and potent for mischief, if not duly eliminated from the body. This elimination it is the function of the skin, in an eminent degree, to do. The sudorific or sweat glands, and their ducts, are charged with this important office. There are about 7,000,000 of these little scavengers opening at the surface of the skin of an average-sized man, throwing off from the surface from 28 to 32 ounces of refuse matter every 24 hours. The action of even a small portion of them, cannot be suspended without disturbance and danger.

The body not only gives off its exhalations to the surrounding air, but also communicates them to all objects with which it and its atmosphere come in contact.

Metallic substances, glass, and wood of which the pores are closed by paint, varnish, etc., are practically impervious to the exhalations, while the two classes of material next mentioned absorb them, but in a very different degree.

I. All vegetable fibres, such as linen, cotton, hemp, jute, paper, unvarnished and unpainted wood; silk, and *unsanitarily* dyed or dressed wool and leather, attract and absorb these "noxious," "self-poisoning" exhalations, and become, when in contact with human beings, gradually offensive and even poisonous in their effect. Clothing, (including linings and padding,) and bedding made from such fibres, are agreeable and wholesome only when quite new and just washed, but soon become saturated with the "noxious" exhalations, producing discomfort, and, if wet, when the vapors are set free, becoming especially dangerous.

II. All kinds of animal wool and hair, leather, (undressed, or sanitarily dressed and dyed,) feathers, horn, readily absorb all the excretions of the skin, but they do not retain them, but transmit, and disperse them at their outer surfaces, by a repulsive energy to which the self-cleansing properties of hair and wool fabrics are properly due. The value of this feature of the woolen system, more particularly with reference to its surgical uses, is hardly to be exaggerated.

To secure its full benefits, the System should be adopted in its entirety. A beginning may be made

with underclothing, which is of the first importance. The outer clothing should be constructed after the Sanitary styles. The upper and lower coverings of the bed should be woolen or camel-hair. The sleeping suit should be a stockinet night-shirt, long, light, soft and elastic; or a woolen shirt with a combination consisting of drawers and socks.

EFFECTS OF EXCESS OF FAT AND WATER IN THE TISSUES.

(1878.)

THE English word "condition" is the only adequate term wherewith to express that state of mind and body in which the health and the working power leave nothing to be desired. Let us first see to what this state, or "condition," is chiefly due. Briefly stated, it is the result of a correct proportion of the most important bodily constituents, and of certain physical properties and processes of the living tissues.

As regards a correct proportion of the bodily constituents, we may restrict our examination to three of these—albumen, fat, and water. The first is the chief constituent of muscle, nerve, blood, etc.; in fact, the principal contributor to the existence of the body. Relatively to this substance, water and fat, although indispensable, may be viewed as auxiliaries merely. A proper condition of the body requires that these three constituents shall be present in certain proportions; and the more strictly these proportions are maintained in it, the sounder it will be and the fitter for work; on the other hand, any excess of water or of fat will lessen its energies, and its power of resisting influences likely to generate disease.

Touching the physical properties, we have first to consider the degree of excitability of the life-conductors of the body; chief among which are the nerves and the muscles; for upon this quality depend energy, speed, and capacity for action in bodily and mental work, as well as in those processes of adjustment, which protect the body against external, disturbing influences. The second point relates to the conditions of elasticity in the sinews, ligaments, vessels, lung-tissues, etc. Any diminution in their flexibility and firmness lessens the energy and the resisting power of the body.

Imperfect action of the skin will induce, with varying rapidity, certain changes in the proportions of the constituents and in the physical properties of the substance of the body.

These changes must be considered separately.

Foremost I place the increase of fat, which almost invariably supervenes upon sedentary habits of life, when there is no lack of food. The injurious effects of an accumulation of fat, as verified by careful experiments, are as follows:

Fat people, other conditions being the same, possess considerably less blood than the lean; and it is a mistake to suppose that obese people are necessarily full-blooded. On the contrary, they are poor-blooded, a condition which, in itself, is a malady made manifest by a never-ending series of minor disorders of the general economy; and there is a variety of diseases to which fat people fall a prey, and succumb, much sooner than the lean—notably all those which are determined by the quantity of blood in the system. With reference to vital energy, it is notorious that persons suffering from poorness of blood are

incapable of doing so much work as those who possess a full measure of blood; because the working power of an organ depends upon the store of blood in it. Another consequence of obesity is, the encroachment of the fat upon the spaces necessary for the circulation of the blood and the play of the respiratory organs. The first of these evils brings about an abnormal distribution of the blood in the system, which is not apparent when the body is at rest, but which shows itself as soon as the circulation of the blood is quickened; when the rapid flushing of the face indicates an excessive rush of blood to the head, likely to cause dizziness or apoplexy. Another irregularity in the distribution of the blood occurs when its return from the lower parts of the body towards the heart is hindered by the reduction of the space in the abdominal cavity. This causes lassitude and a sense of heaviness in the legs, and a tendency to the formation of varicose veins; while, if the elimination of water from the system be impeded, dropsical swelling of the legs will ensue. The obstruction of the return of blood from the abdominal organs, causes the extremely troublesome, and, in their latter stages of development, even dangerous, hemorrhoidal complaints which almost invariably afflict the obese. An impeded circulation is also one of the reasons why fat people are less capable of work than the lean. If an organ be required to do work, it requires 80 per cent more blood than when at rest. Every exertion therefore necessitates an alteration in the distribution of the blood, to which fat stands as a hindrance, blocking the way so that the blood cannot flow in sufficient quantity to the part that requires it.

The accumulation of fat in the thoracic cavities (chest,) is also mischievous from its interference with the free play of the lungs. On this point I myself took measurements, which went to show, that, among men forty years of age, the lung, or breathing capacity, of the obese, was, with a full inspiration, 18 cubic centimetres of air only, to every kilogramme of weight of body; while the lean could inhale from 40 to 50 cubic centimetres, or about three times as much. It follows that the obese are disqualified for exceptional exertion necessitating greater breathing than usual, and a more copious flow of blood through the lungs, which have space sufficient for neither the air nor the blood. The obstruction caused by fat is shown by the rapidity with which an obese person becomes heated by exertion; but, even in repose, this interference with the free play of the respiratory apparatus is injurious, and renders the body sluggish, because it checks the excretion and dispersion of the substances (carbonic acid, water, and lactic acid) which hinder the proper functional processes of the body.

With regard to the greater liability to attacks of disease in cases of obesity, I may particularly refer to the danger of pulmonary affections. If any such malady renders one portion of the lungs unserviceable, life will be further shortened by the reduced working capacity of the remnant which may be still available for use. Fat people are also far more susceptible to such maladies as gout, dropsy, emphysematous lesions, etc.

The effect of fatty deposits upon the physical properties of the living tissues, and especially upon the measure of their activity, may be easily verified by

experiments. If a nerve be severed in a living animal, so that the brain can no longer transmit its energy, and the brain be thus reduced to a condition of rest, globules of fatty matter will gradually be deposited in it, and in proportion as this proceeds, the activity of the brain will decrease. A similar change takes place in the muscles when their nerves have been cut. Their power to contract, and the energy of the contractions diminish in the same proportion as the granules of fat increase in number and size. Since, therefore, the degree of excitability in nerve and muscle, measures the power and energy, not only of bodily, but also of mental work, it will be easily understood why corpulent persons become inert and limp both in body and mind. As regards the mind, I may add that fatty degeneration of the brain is one of the most frequent causes of imbecility and mental aberration.

From the foregoing, it will be seen, that any one predisposed to obesity, and wishing to preserve the integrity of his health and working capacity, should be ever on his guard against any superfluous deposit of fat in his body. Any sign of such a deposit may be regarded as an evidence of wrong methods of living, and an admonition to adopt such measures as will prevent the further accumulation of fat, and dispose of any excess already deposited. To either of these ends there are no better means than such as will ensure an increased action of the skin. Against the well-known BANTING cure—the greatest possible abstinence from fatty or farinaceous food—I would caution all persons with whom the deposit of fat has attained to any considerable proportions, because,

under such circumstances, such abstinence may become dangerous ; and even though it bring no peril with it in particular cases, the efficacy of the BANTING cure is infinitely inferior to the agency of an active skin in restoring a healthy condition to mind and body.

An inordinate increase of the percentage of water is not so apparent as an excessive deposit of fatty matter—if the two morbid conditions do not manifest themselves concurrently, which is generally the case—yet it makes itself distinctly felt ; the flesh is flabby, and doughy, whereas under normal conditions it would be elastic and firm. An accumulation of water in the system directly tends to increase the percentage of water in the blood, which means poor-ness of blood, and a consequent lowering of the powers of all parts of the body ; for their nutrition is lessened, and the water in them increases, lowering the vital forces, or, in other words, diminishing the normal activity of nerve and muscle, and eventually suspending it altogether.

This is shown, on the one hand, by the phenomena attendant on dropsy proper ; and, on the other, by the effect of the diminution of water in the tissues, upon the rate of nerve transmission. I had evidence of this in an experiment made upon myself and a few thoroughly healthy subjects, among whom were two of our local, medical men. In this experiment I endeavored to express by figures how far the loss of water in the tissues, caused by the action of a Turkish bath, would affect the speed of nerve transmission, not only in the sensory and motor nerves, but also in the cranial nerves. The experiment was conducted in the following manner :

A stop-watch is used, the index-hand of which, by simple pressure exerted upon two separate knobs, can be disconnected and reconnected at pleasure with the clock-work, which continues to run ; and the stop-watch is so graduated as to indicate spaces of time as short as two two-thousandths of a second. The operator holds the knob that sets the index-hand in motion, while upon the stoppage-knob rests the finger of the person undergoing the test. At the commencement of the trial the index-hand stands still, and its position is noted. As soon as the operator starts the index-hand, by pressing the knob under his control, the other person must arrest it by pressing the second knob. The difference between the two readings or positions of the index, will then accurately indicate, on a scale of one two-thousandth part of a second, the time taken by the above excitation to run its course through the eye, the optic nerves, the brain, the nerves of the arm, and finally reach the muscles actuating the finger that presses against the knob. I made another experiment. The stop-watch was connected with an electric bell, which indicated to the subject of the test, the starting of the index-hand. This gave the time of transmission of the nervous impulse from the ear to the finger. 'Thirdly : to test the activity of the brain, two bells were connected with the clock-work, one on the right hand and the other on the left of the subject of the test, in each of whose hands was placed a knob with which to stop the index. The operator held in his grasp two other knobs, enabling him to ring the bell on either side at will, when the index-hand was set a-going. The subject of the test was required to press

the knobs right or left, according to the right or left ringing of the bell. The intervals of time, as ascertained in this last trial, were constantly longer than those recorded in the second experiment, when only one bell had been used ; and the deduction of the interval of time, involved in the second experiment, from that required in the third experiment, will give the duration of the psychical operation upon which depends the act of discrimination between right and left. Of course such tests need repetition at least half a dozen times, and the average will give the result. In the series of experiments above described, the tests were applied in the afternoon of the day previous to the persons' taking a Turkish bath, and repeated the following day at the same hour, but after a Turkish bath taken in the morning. In each case there was increased rapidity of action, the average amounting to 13 per cent. This is the numerical expression of an important enhancement in the capacity of the nervous and mental energy.

Before I had instituted these stop-watch experiments, I had become aware, in the following manner, of the great influence exercised by the relative proportion of water in the body upon the working powers of the mind. Towards the end of last winter, and, without signs of any particular sickening, I experienced so notable a diminution of my working capacity, while engaged in the preparation of a book on *The Working Power of Man*, that I could at most accomplish but eight manuscript pages a day, while I found I required a very unusual period of sleep. Contemporaneously with this, I had increased in girth very considerably. It occurred to me at the time

that the cause of this diminished capacity for work might be attributable to increase, not only of fatty matter, but of water also ; and I resolved to seek a remedy, commencing with a few Turkish baths, and continuing with a regular course of exercise. Ere I had reached the latter stage of my training, my capacity for mental work had so far improved, after five Turkish baths, that I could accomplish nearly double the amount of manuscript in the course of the day.

In considering how far an increased percentage of water in the system, enhances the liability to sickness, the fact may be instanced, that decay sets in much sooner after death in dropsical cases than in others ; showing that an excess of water accelerates the decomposition of the bodily substance. To this may be added, that, when the blood is watery, and, therefore, in a more fluid state, the tendency to injurious irregularities in its distribution, is greatly augmented ; and I would, at least partly, ascribe sensitiveness to so-called colds and chills to an excess of water in the system, upon the following grounds : From the teachers' attendance-books at the two Stuttgart High Schools, I made a note of all cases of non-attendance in the first class, taking the totals for the winter months from the year 1857 down to 1874, and the figures are : For October, 159 ; November, 532 ; December, 391 ; (but considering the Christmas holidays, a corrected estimate should bring it up to at least 500 ;) January, 682 ; February, 896 ; and March, 730. As non-attendances at school are mainly referable to chest affections, colds, and similar complaints, these figures show that liability to colds

in the course of the winter, is gradually augmented, and reaches its highest point toward the end of the season. In winter time there is a variety of circumstances likely to operate in increasing the percentage of water in the system ; there is less bodily exercise ; the thicker clothing is less pervious to the water given off from the skin ; the indoor life in the stagnant atmosphere of rooms, arrests evaporation ; and there is little or no sensible perspiration. This and other inquiries have led me to the conclusion that predisposition to colds and chills is due to excess of water in the system, and that the term to "harden" the body is very significant. The bodily substance must be made *hard* by draining from it the superfluous water, if it is effectually to resist the exciting causes of colds and chills. I have had an instrument made which will enable me to verify statistically, and by actual experiment with living persons, whether my surmise on this head be correct.* In addition to the change in the due proportions of the bodily constituents just described, there supervenes a change in their physical constitution. The most vital of physical properties is the excitability of nerve and muscle. Upon this depend the rapidity of bodily and mental labor, the efficiency of the organs of sense, and the activity of all the bodily functions in relation to change of substance, and the phenomena of motion. We have already seen that the energy of the bodily tissues is lessened by the lodgment of water and fat, which is generally the direct consequence of a sedentary life ; because the greater part of the body remains inert.

* See "The Specific Gravity of the Body," page 33.

That disuse decreases the measure of excitability, or the faculty of responding to a stimulus, is shown in cases of severed nerves and paralyzed muscles.

Another physical property impaired and changed for the worse by insufficient action of the skin, is the elasticity of those parts of the body which are moved by the nerves and the muscles. The effect on the working capacity shows itself (to borrow an example from the lower animals) in the shape of stiffness, which is very noticeable in animals kept too long in the stable. But a greater evil is the loss of elasticity in the blood-vessels and the lungs, diminishing the capacity for work and the power to withstand the causes of disease. Just as, from long disuse, a gutta-percha hose will lose its elasticity, turn hard, and become brittle; so, also, will it fare with the blood-vessels if their activity be not maintained by the free exhalations of the skin. They can no longer adequately respond to the varying necessities of the blood-distribution, required to protect against the causes of disease, or called for by changes in the employment of the body; and if, in the end, the vessels become so deteriorated as easily to break, predisposition to apoplexy is established. Diminished functional activity of the vascular system, and of the lungs, moreover, is mischievous in its effects upon the proportions of the constituents of the body. There is lessened activity in the interchange and restoration of matter, leading to the accumulation of water and fat, in the elimination of which the above-named organs of the body play a very important part.

THE CAUSES OF DISEASE, AND
DISEASE GERMS.

(1878.)

I HAVE for some time studied the subjects indicated in the heading of the present paper, particularly with a view to ascertain the cause of the liability of the human body to disease, and the means by which it may be steeled effectually to withstand external, unhealthy influences. In professional parlance, the result of this power of resistance goes by the name of "immunity," and in the following remarks I shall make occasional use of this word in the above sense.

My inducement to revert to these studies is a remarkable coincidence between the latest outcome of my researches and the investigations prosecuted by Professor NAEGELI, the Munich botanist, on the subject of the most important group of the external causes of disease; namely, the poisons of infection—on which he has published a book entitled *Die niederen Pilze in ihrer Beziehung zu den Infektionskrankheiten*.*

I will begin with an account of my own discoveries, to be followed by an exposition of those of Professor NAEGELI. My attention has for years been especially directed to that particular change in the condition of the body, which is popularly called

* "The Subordinate Fungi or Germs in their relation to Infectious Diseases."

training, or hardening. The problems for solution were as follows: In what does this change consist? what are its causes, and what its uses? Professional works supply but scanty information on these points.

The first result of my studies was, that, in the process of hardening the body, I recognized such a change in the relative proportions of the three most important, constituent parts of the tissues—albumen, fat, and water—as clearly pointed to the conclusion that the hardening is mainly brought about by the elimination of fat and water. I also contrived to obtain, by taking the specific weight of the body, numerical values expressing in figures the hitherto undefined notion embodied in the term “hardened,” or “in good condition.” As water and fat are lighter substances than albumen, it follows that a man in good condition must be specifically heavier than one in a weaker condition, and this has been determined beyond doubt by measurement and weight.*

Another outcome of my studies, was a clearer perception of the circumstances favoring the process of hardening the body. The misconception that this consists in simply inuring the body to cold, has wrought much evil to the general public. I have succeeded in determining that a system of clothing, which admits of the free escape of the watery vapor, given off by the skin, tends to harden the body, while clothing, which impedes the elimination of water from the tissues, is enervating.

The process of hardening the body results in the gain of firmer and more compact flesh,—richer in

* See “The Specific Gravity of the Body,” page 33.

albumen, and freer from fat and water. I believe it to admit of no further doubt that this is equivalent to an increase of the power of the body to withstand the action of morbid influences, and that, consequently, the current conception of florid, exuberant health is altogether erroneous. The healthiest people are endowed with tough, wiry, firm flesh, and well-knit frames, and such subjects withstand much better not only climatic changes, but also those inflammatory affections which are engendered by the intrusion of living disease germs into the human body.

Shortly before I had thoroughly possessed myself of these facts, there appeared the above-named work by Professor NÆGELI, containing disclosures so noteworthy on the subject of the so-called infectious diseases, that I at once formed the design of communicating some of its leading features to my readers, without, however, then suspecting into what intimate relation NÆGELI'S researches might come with my own.

To Professor PETTENKOFER, of Munich, belongs the merit of the discovery that the germs of infection in cholera and typhus (nervous fever) find a dwelling-place in the underground water-passages into which wells are sunk ; that, in such localities, they will not only exist, but multiply ; and that from this base of operations they carry out the work of infection by finding ways to reach the human body. He was the first to promulgate the fact, since extensively confirmed by others, that the danger of infection increases when the level of underground water is lowered, and conversely that the danger diminishes as the water rises. This harmonizes with the fact

that intermittent fever, which is generated in marshy surfaces, makes its appearance with augmented frequency when the sinking of the water level lays bare more extended tracts of marshy surface, thus allowing the unquestionably animate germs to rise in the air.

On this so-called underground-water theory of PETTENKOFER'S, NÆGELI grafts his observations. From a series of experiments, carried on for a period of nine years, with the subordinate fungi, or germs, he is led not only to adopt, but to enforce with fresh and convincing arguments, the opinion long ago expressed by other observers, that the germs of infection in the above-named maladies belong to the same group of living organisms as the familiar ferment of putrescence—that is, to the group of bacteria which are so exceedingly minute that, according to NÆGELI, 30,000 milliards of them make up the weight of one gramme.

That certain soils, such as that of Munich, are especially productive of typhus, is explained by NÆGELI, taking PETTENKOFER'S views into account, in this wise:

“The first condition of a malarious soil, breeding endemic and epidemic maladies, is underground water, lying not too far from the surface, with alternate rise and subsidence of level, resulting in alternations of wet and dry strata. When these strata become dry, the germs cling to the earth, and where the soil is light and the air follows the subsiding level of underground water, the germs pervade this underground atmosphere, and if there be an issue towards the surface, they will rise through it into the open air.”

He shows very clearly that this underground air is attracted into houses by the suction of the fires in the kitchen and other rooms ; and he adds that the best-warmed rooms are the most dangerous. Professor NAEGELI, therefore, sets his face against heated bedrooms at night, and even suggests that by heating some other unoccupied room at night the course of the germs may be diverted from the sleeping-rooms.

But it appears that the germs cannot rise with the underground air whenever the stratum of earth containing them has again become wet, either by a fall of rain from above or by the elevation of the underground water-level. The germs will then cling to the ground so firmly that not even a powerful current of air avails to detach them.

Two remedies are suggested for this chief cause of an epidemic soil : the complete removal of the underground water, or at any rate its relegation into lower depths ; or, if this be impracticable, the maintenance of a constantly uniform surface-level of the underground water.

To guard against the penetration of air ascending from epidemic soil, Professor NAEGELI recommends cementing the cellar floors and walls, and the ground floor ; and, as the underground air not only rises into the interior of houses, but makes its way through the walls as well, he further suggests an air-tight outer casing for the foundation walls. Finally : with regard to the constitution of the soil, the danger will increase with the degree of its porosity or capacity for holding underground air, and of its readiness to dry. Hence firm, clay soils are exempt from in-

fection, while the most unhealthy soils are those consisting of gravel and coarse sand intermingled, like the Munich soil.

Professor NÆGELI'S experiments, which extended over a period of years, on the conditions of the generation and growth of the subordinate fungi, or germs, have led him to the conclusion that these fungi require, as nutrient elements of existence, certain substances which are soluble in water. But they can live only on condition that the pabulum so formed shall consist of certain proportions of water and food materials—in other words, provided that the solution has the required degree of concentration. Here we need only consider the effect of an augmentation of this degree; and I shall adduce a few familiar examples by way of illustration.

The fermentation of wine must, fruit-juices, brewers' mash, etc., is effected by means of the fungus familiarly known as "barm," or "yeast." This process of fermentation may be checked by simply withdrawing some of the water from these juices,—that is, by thickening the liquor,—when (if the abstraction be sufficient) fermentation will cease, because the germs cannot subsist in this excessive proportion of the nutrient material—in this case, the sugar. A similar effect is produced if, in stead of drawing off water, the quantity of sugar be increased.

The same method applies to the germs of putrescence. To prevent the tainting or putrefaction of meat, some of the water is withdrawn from the juices, which are thereby thickened. The degree of concentration under which the germs lose their

potentiality for decomposition and dissemination, is not equally high with all the species. Professor NÆGELI divides them into three classes in this respect : the bacteria, to which belong the ferment of putrescence and the germs of disease ; the yeast fungi, the most familiar among which are the brewers' yeast and the vinous ferment ; and the fungi which produce what is called mildew.

Now, between these three cases it should be noticed that, while the yeast fungi need and bear a higher degree of concentration than the bacteria, they are in this particular far surpassed by the mildew fungi. For instance, a moderate drying will stay putrefaction of meat ; but to prevent mildew, a much higher degree of desiccation is necessary. A comparison between the germs which cause mildew, and those which cause fermentation, may be instituted by reference to fruit-juices and preserved fruits. Moderate thickening will suffice to check fermentation, but to guard absolutely against mildew, the thickening process must be carried much further.

Any substance which germs are unable to use as aliment, becomes inimical to their existence when it has attained a certain degree of concentration. This point is of great importance in its application to what is called disinfection, and NÆGELI points out that insufficient disinfection, as of cesspools, for instance, involves much more risk than the total neglect of it.

He says: "If germs derived from cholera, dysentery, and typhus cases find their way into cesspools, they will retain their specific nature for a short time only ; thereafter they either die or lose their infectious properties. On the other hand, the consequence

of insufficient disinfection; *i. e.*, of disinfection short of the degree of concentration that kills—is, that morbidic fungi will continue to germinate and ferment, while, at the same time, and for that very reason, they will preserve their specific nature of infection. Such inadequate disinfection, therefore, is tantamount to preserving the germs, whose infectious quality is revived when they, through insufficient disinfection, emerge into the upper air, and make their way into the human body.”

The most interesting of Professor NÆGELI’S observations, is that there occurs a *struggle for existence* between the different species of the germs when they come into contact in a nutrient solution. This explains, not only the connection between the process of bodily hardening, and the power of resisting epidemic attacks, but also many phenomena attending the fermentation of liquors; and on that account, I am induced to dwell at somewhat greater length upon the subject, quoting NÆGELI’S own words :

“It was formerly assumed that any plant will be found wherever climate and soil favor growth, provided that that seed had previously reached such spots. Now, however, we know that this plant-growth depends quite as much upon its surrounding fellow-plants, as upon climate and soil, and that, in particular, the most closely allied species will exert a more decisive influence. Many species can grow in certain localities only if others, ranking in the same genus, be wanting. For instance, the rusty-looking Alpenrose thrives well in calcareous soil, but only when the hairy Alpenrose is absent. If the latter be present, it will utterly exterminate the former. The same

law holds as to the two primrose species found upon more or less damp grounds."

(I may add that the most familiar amongst these plant-struggles, are those occurring between useful growths and weeds.)

"The same law governs the lower fungi. One genus, which under given circumstances will thrive well, is exterminated by another genus which here appears the more favored plant; whereas, the former, under differing conditions, is strong enough to expel the latter. Inattention to this fact has given rise to many erroneous assertions respecting antiseptics."

To render these phenomena more intelligible, I will adduce an example. If germs of putrefaction, or fermentation, and of mildew be placed in certain saccharine solutions having a neutral reaction, (that is, neither acid nor alkaline,) only the first-named will multiply, setting up lacteous fermentation. But, if to the same solution be added a half per cent. of acetic acid, the germs of fermentation alone will multiply and cause vinous fermentation; whence it comes that must, containing too little acid, will turn sour; and, if, finally, 4 or 5 per cent. of tartaric acid be put into the same solution, only mildew fungi will be produced.

It would be wrong to conclude from these facts, which invariably recur on every occasion, that a half-per-cent. of acid prevents putrefaction, and 4 to 5 per cent. prevents fermentation; for the germs of putrefaction will actively multiply in the same nutrient solution with an additional $1\frac{1}{2}$ per cent. of tartaric acid, *provided they be not exterminated by the germs of fermentation.*

I may explain that must, or unfermented new wine,

without acid, would unquestionably turn sour, and : rather large proportion of acid would be needed to prevent the souring of the wine; but if, on the other hand, vinous ferment be added, the latter will gain the advantage, even with a low percentage of acid.

Professor NÆGELI then goes on to show, that the strength of individual numbers also exercises a decisive influence in the struggle. It would appear that when one kind of germs takes possession of a solution in great numerical strength, they will vanquish their adversaries, (if the latter be in a minority,) under conditions that would insure their own defeat were they deficient in numbers. This we see in unfermented wine, and in brewers' mash; to prevent them from souring, yeast is needed in such quantity that it may retain the mastery over the ever-intruding germs of the acetous ferment. With a knowledge of these facts, we can explain the relation of the body to the germs of disease.

The following is the fourth instructive discovery of Professor NÆGELI, respecting the subordinate, fermenting fungi. Each species excretes certain elements, which, as a rule, are entirely characteristic of the species. Thus, vinous ferment and brewers' yeast, throw off, as a special excretion, tartaric acid; the "mother of vinegar," vinegar; the rennet or lactous ferments, lactic acid; other ferments butyric acid, and the ferment of putrescence, the well-known offensive effluvia.

It may be observed of these excretions, that they imperil the existence of the germs themselves whenever they accumulate beyond a certain percentage in the solution which the latter inhabit.

Thus, for instance, fermentation will cease in must-liquor very highly charged with sugar, when the percentage of alcohol has attained to certain given limits, even though there should still be a sufficiency of fermenting material—that is to say, of sugar—unless, by exposing the solution to the air, the notoriously volatile tartaric acid is allowed to escape.

The same applies to decomposition. In open cesspools, putrefaction proceeds until all the material is consumed, because the offensive excretions of the fungi escape; but when a cesspool, fosse, or ditch is kept closely shut down, the process of decomposition is completely arrested, as fermentation would be in a well-corked bottle. I have had abundant evidence of this in my own experience with putrescent sea-water and decaying carcasses.

NAEGELI especially addresses himself, in his book, to the task of determining from his experiments what preventive measures should be adopted with reference to the morbid germs existing elsewhere than in the body; but of this question I shall not speak now. He explains a part only of the phenomena of the relations of these germs to the living body, although he might certainly have elucidated the whole problem from his experience of them in inert solutions.

What NAEGELI correctly apprehended is shown when he gives, as an illustration of the relation of these germs to the living body, the case in which, in his experiments, two different kinds of germs came into conflict in one nutrient solution.

This bears directly upon the contest between the germs and the living tissues of the human body; a contest which begins in a nutrient solution suited to

both the combatants alike; and very important is NÆGELI'S assertion that the contest turns upon numbers. Therefore, since the number of the bodily tissues concerned is a fixed quantity, it will depend upon the *numerical strength* of the germs whether they will set up disease or not.

The assault may be so overwhelming that the body will inevitably succumb; but even the most dangerous germs of infection are powerless for evil if the attack be commenced by an insufficient number. NÆGELI rightly says, that, until he made this discovery, he had altogether doubted whether the infecting matter could consist of live organisms; for he reasoned as follows:

“One such germ in a sufficiently nutrient solution, which the human body usually affords, can propagate 100,000 individuals within seven or eight hours, and would thus invariably induce disease. Yet this cannot be the case, or we should be driven to the impossible conclusion that, during an epidemic of cholera or typhus fever, those that sickened had alone inhaled or swallowed these tiny microscopic germs, while all other members of the community had not.”

The fact that, during the prevalence of an epidemic, one section of the inhabitants enjoys good health, another feels but slightly affected, a third sickens more seriously, while a fourth section dies, some speedily, others after protracted illness, is ascribed by Professor NÆGELI to the varying strength of the infection; but he does not take into account that it must also depend upon the condition of the body and its juices, as to which of the two

combatants in the struggle shall gain the victory. In this direction he touches upon the familiar experience that a person once attacked by small-pox, scarlet fever, typhus, etc., will for a greater or less subsequent interval of time enjoy immunity from those disorders. In this, as we shall see, he is correct, without, however, hitting the mark as accurately as he might have done from the knowledge gained in his experiments with germs elsewhere than in the body.

Researches prosecuted for many years, having long ago convinced me that an inordinate percentage of water in the body will enhance the liability to sickness, I at once recognized in NÆGELI'S discoveries, the true explanation of the fact ascertained by me, that seasoned soldiers enjoy greater immunity from infection than men less far advanced in the term of army service. Strong and sustained bodily exercise stimulates the activity of the skin, draining the water out of the body—that is, it reduces or thickens the mass of the bodily juices.

In times of infection this increased density of the mass is, of itself, an advantage to the living tissues of the body, because the firmer these are set, the greater will be the energy of the vital forces for their struggle with the germs of infection, which are weakened in proportion as the degree of concentration of the bodily juices is raised. Hence, a comparatively small difference, in the percentage of water in the body, may decide the issue in the struggle of the latter against the germs of infection.

What, then, may be learnt from these discoveries as applicable to infectious diseases? At least, this:

That the latter take root in that effete bodily condition which is the consequence of an irrational manner of living. I have examined from this point of view, whatever is known respecting all kinds of epidemics, and everything confirms this view. Were it customary to live according to the dictates of reason; to steel, harden, and temper the body; we should be as exempt from epidemic disease as are those animals that live in the open air.

Destructive infantile disorders, like scarlatina, measles, and quinsy, are emphatically maladies of enervation and enfeeblement. The prevalent irrational treatment of children, not only in their infancy, but also during their school years, is mainly responsible for these disorders.

THE SPECIFIC GRAVITY OF THE BODY.

(1878.)

THE discovery that a superfluity of tissue water in the body, materially increases its liability to sicken from infectious disease, became the keynote to my studies on "Strength of Constitution;" a term which includes the question of greater or less liability to sickness, as well as that of the working capacity. Not only did it then clearly appear upon what strength of constitution is based, and by what means it may be enhanced, but also that it can, with a large degree of certainty, be estimated by measurement.

In compiling a tabulated statement of measurements of soldiers, for the purpose of calculating the average of health for each of the three years of army

service, I had at first no suspicion of the astounding result to be obtained by the computation of the weight per liter (quart) volume of the individual soldier; indeed I feel satisfied that no professional man would have expected to find so great a variation.

The smallest liter-weight among the sixty-five men measured, amounted to 764 grams, the highest to 1,060 grams;* a difference of almost 40 per cent. If, in these two extreme cases, the men had been equally tall and stout—that is, of quite the same bulk, say 70 liters—the light man would have weighed 118 lbs., the heavy man $159\frac{1}{2}$ lbs., so that the latter would have been heavier by $41\frac{1}{2}$ lbs. The difference is the more surprising, if we take into account that these two men were almost of the same age, varying only by one year; that the light man was by no means a sickly, feeble subject, but apparently so healthy and strong that no objection had been raised to his admission into the army. Still greater differences will be found if the specific gravity of people of the lowest constitutional vigor could be measured.

If the differences in the weight of the liter volume of the strong and the weak amounted merely to a fractional percentage, they might be regarded as a curious scientific discovery of no practical importance. But the case stands otherwise.

An instrument is required which shall determine, at least with approximate accuracy, the bodily bulk. A method of testing the bodily condition would then be supplied, which in point of accuracy, and diversity of application, would far surpass any that has hitherto

* 1,000 grams = 1 kilo = about $2\frac{1}{2}$ lbs.

been devised. Now, such an instrument can certainly be constructed, but not by a scientific man without the necessary means, unless at the public cost. The simplest way of ascertaining the bulk of the body is by its immersion in water, but this method is cumbersome and inconvenient, and is impracticable with invalids, females, etc. As a substitute for the above method, the following apparatus is worthy of consideration. It consists of an inclosed air-tight chamber, connected on the one hand with an air-gauge, and on the other with a second chamber, the air in which can be forced into the first-named chamber. If the first chamber contains nothing but air, the air forced into it from the second chamber will raise the column of mercury in the gauge up to a certain point. By introducing a compact body into the first chamber, and thus displacing the air, the mercury will be made to rise above the level previously attained, in proportion to the greater bulk of the body intruded. Consequently the bulk can be correctly estimated from the height of the column of mercury. Then weigh the body, and divide the weight by the number of volumes, and the quotient will denote the weight of each litre.

Small instruments of this kind already exist, but the problem is to make one large enough to admit an adult. The cost would not be great, and the money would be well expended.

The question now arises as to what properties of the body, will the determination of the body's weight, per unit of capacity, (liter,) afford information. The answer must be sought in a consideration of the parts which the various bodily constituents that

are weighed, play in the production of vital phenomena.

The lightest bodily substance, except air, is fat, with a liter-weight of 937 grams. Important as an element of nutrition, it becomes injurious when present in excess, causing a diminution in the quantity of blood, and impeding the circulation, while its decomposition evolves an abnormal quantity of heat. Corpulent persons are incapacitated for strenuous work, because they so rapidly become heated; and, if overtaken with illness, they readily develop marked feverish symptoms.

Next to fat, water has the lowest liter-weight, namely, 1,000 grams. Some of the injurious effects of an excess of water in the body, have already been explained; but I will recapitulate the most important points:

1. Superfluous water renders all the tissues flabby, and diminishes their power of resisting mechanical strain. They become more brittle, as regards the bones; are more easily lacerated and distended, and the natural connection of the organs suffers. Thus bone fractures, dislocations, bruises, lacerations, intussusception, (intestinal invagination,) etc.; and the intrusion into the system of alien matters, including the germs of infection, from the coarsest to the most minute, will more readily take place; the ability for strenuous exertion is diminished, and the liability to sickness increased. Through this relaxation of the blood-vessels, most notable in the veins, originate those troublesome, hard-to-be-cured vein-enlargements known as hemorrhoides and varix, or varicose veins.

2. Excess of water in the muscles has a disabling effect, inducing a feeling of lassitude. A watery muscle is feeble, and tires quickly.

3. Excess of water in the tissues is particularly injurious to the nervous system. It heightens the sensibility of the nerves, so that trifling influences produce painful and morbid excitement. Persons thus affected easily catch cold, suffer from nervous irritability, and, in short, are especially exposed to all sorts of nervous disturbances. Moreover, excess of water in the nerves becomes a hindrance to the transmission of their excitation, a state which is bad in every way; for it increases the liability to sickness, while lessening the capacity for work, particularly mental work. The flow of thought in the brain is obstructed, reflection becomes difficult, sluggish, less comprehensive; and the memory fails. There is a form of idiocy, in which the brain cavities hold abnormal quantities of free water. An excess of water permeating the brain substance, will of itself induce dullness.

4. The injurious effects of an excess of water in the blood and other bodily juices, may be inferred from what has been stated in a preceding essay on the subject of liability to infection from disease germs. A watery condition of the stomach and of the bowels, favors the propagation of the seeds of infection in the *primæ viæ*, or alimentary canal, so that the germs of cholera, or of dysentery, or, probably, of mucous fever, are enabled to make a general attack against the body, and will more readily ferment if the bodily juices be watery.

While certain quantities of water and fat are neces

sary to the existence of the human body, any excess above the indispensable quantity, is detrimental. But since every other constituent of the human body is specifically heavier than the water, and the fat, a body which possesses these in an excessive quantity must be specifically lighter than one normally constituted; so that a man of inferior specific gravity will be less fit for work, both physical and mental, and less capable of withstanding morbid influences of every kind.

The conclusion, based upon the nature and influence of the lighter bodily constituents, (water and fat,) that the low liter-volume of the living body is an unfavorable sign of its condition, is confirmed when the heavier elements are considered.

I have ascertained by experiment that thoroughly dried muscular flesh has a liter-volume of 1,357 grams—water 1,000, and fat 937. Now we know, beyond a doubt, that the actual working substances in every living tissue, are those which remain after drying; *i.e.*, the so-called albuminous substances, and the salts always found in combination with them. The more plentiful the supply of such substances in the living tissue, the more energetic are its vital manifestations. A muscle, for instance, will be firmer and more powerful in proportion to its solid, constituent parts, and the same law applies to the energy and rapidity of its contractions. The larger the amount of solid constituents in the brain and general nervous system, the more energetic will be their manifestations. The same may be said of the intestines, etc. Chemical experiments show that the mass of solid residue in the tissues may present a very consid-

erable divergence, (as much as 32 per cent.,) and hence it is quite intelligible that a strong person, thoroughly fit for work, should exhibit a much higher specific gravity than a weak, sickly person.

Lastly, a cardinal point is the quantity of bone-earth, or phosphate of lime. Of all the elements largely entering into the constitution of the body, this is the heaviest, being equal to 3,180 grams per liter-volume. It is well known that the robust possess strong, compact bones, while the weak have delicate and light ones. The more energetically a man works, the more powerful become his bones—that is; first, they increase in length and thickness; secondly, the protuberances to which the muscles grow become enlarged; lastly, not only does the bone substance accumulate material, but it hardens and acquires a higher specific gravity. We see this in animals; the bones of the domesticated hog or cow, which takes little exercise, are spongy and brittle, while the bones of the same animals in a wild state are extraordinarily hard, compact, and heavy. The following illustration will make this easier to be understood. If coal or wood be consumed in a stove, the products of the fuel will be of two kinds—the *gases* that escape through the chimney, and the *ashes* which drop into the ash-box. The quantity of ashes collected will show what amount of work the fire has done. The process in the body is analogous: the more the body works, the more nourishment will it use up, giving rise to substances (such as carbonic acid, water, and urea) that quit the body, leaving ashes, which the body retains, in the form of bone-earth. The bones collect the ashes, and the larger

their store, the greater has been the amount of work performed by the body. Hence old people have a larger store of bone-earth than young persons; but, if of two individuals of equal age one possesses more bone-earth than the other, it will be an unmistakable sign that the former has done more work than the latter, either from superior diligence or the force of circumstances. Thus the specific gravity of a man shows whether he is active and accustomed to labor or not.

These considerations are of importance in their application, both to the practice of medicine and to health-culture. On the latter point they lend additional weight to the arguments with which I have repeatedly sought to enforce my sense of the value of hardening the body by the promotion of the activity of the skin, the thorough ventilation of rooms, etc.; because it is now obvious that these measures not merely afford protection against colds and chest complaints, but also operate as preventives against epidemic contagion.

In this discovery there is much that is reassuring; for, having regard to the enormous difficulty of warding off the attacks of these invisible germs of infection, and of evicting them when in possession; considering, moreover, that the range of infectious diseases continually widens with the extension of facilities of communication, an anxious temperament might give way to despondency. My researches remove the main ground for discouragement. If the body be adequately hardened, infection need be no more apprehended than colds and chest complaints; and the method which I have explained of ascertain-

ing, by determining the specific gravity, whether the requisite degree of hardening has been obtained, should give additional ground for this sense of security.

Hence, the whole rule of health may be summed up in the simple maxim: Procure, and maintain, the highest possible specific gravity—that is; first, prevent the deposit of fat; and secondly, promote the elimination of water from the tissues, avoiding everything calculated to check it.

THE SOURCE OF THE EMOTIONS.

[In his chapter on “The Source of the Emotions,” the Doctor treats of all the emotions under two different and opposite classes, the essential distinction of which is, painful and pleasant; agreeable and disagreeable; cheerful and gloomy; hopeful and despondent; exalting and depressing; encouraging and disheartening; invigorating and enervating; exhilarating and dispiriting; sorrowing and rejoicing, each of which classes he makes dependent upon certain physical states or principles, designated respectively the “salutary principle,” or “essence,” and the “noxious principle,” or “essence.” The prime condition of the predominance of the *salutary principle*, is health; of the *noxious principle*, disease. These principles have physical properties *recognizable*, chiefly, by their “odors”; the salutary, by agreeable; the noxious, by offensive odors. The predom-

inance of the salutary principle signifies health, good humor, cheerfulness, vivacity, courage, energy, hopefulness, freedom from offensive odors, a good appetite, and power to resist infection. The predominance of the noxious principle implies the opposite of all these states and their consequences, prominent among which is liability to infection. In case of anger, dread, grief, excessive worry, the noxious principle "permeates all the bodily juices, and affects them like a poison."]

The Doctor proceeds as follows:

It is well known to physicians and to others, that great terror, great dread, alone, often causes the most serious derangements of health, even sudden death. Also, that illness is attended with much greater risk when accompanied with worry, grief, or depression; while it will augur well for the issue if the patient be relieved from apprehension, and a state of cheerful confidence, or, at any rate, of composure be established. Further, that terror, dread, grief, and care, materially lessen the power of resisting certain disorders, foremost among which are epidemic diseases, such as the plague, cholera, dysentery, and small-pox. Of cholera, for instance, it is well known that a man thrown into a state of intense dread at sight of the dead body of a cholera patient, will almost certainly sicken, and often with such speed that within a few hours he may pass from a state of sound health to collapse and death. Similarly, in time of war, armies defeated and pursued, present a far more favorable opportunity for the ravages of epidemic disease than

their pursuers, flushed with victory, even though the defeated and the conquerors have occupied the same camping grounds in succession.

For all such phenomena there has hitherto been no satisfactory explanation; they have been ascribed to nervous agencies, the real cause being entirely overlooked; namely, a peculiar volatile essence, the "noxious" principle, which permeates all the bodily juices and affects them in the manner of a poison. That some such influence must be in operation, might have been inferred from the fact of hair turning white as a consequence of dread, grief, or care; this has been known to take place in a single night, when persons have been exposed to great dread or sorrow. Here the nervous system cannot be the agent, for the nerves do not reach into the hairs.

My discoveries make these phenomena clearly intelligible. The volatile, "noxious" principle, when released from the brain, enters the blood, by which it is conveyed to all parts of the body, acting upon each particle of living substance as a paralyzing poison. Any reader who has once experienced it, knows how terror and dread affect the organs which are moved and controlled by the will. The limbs refuse to act, the voice is choked in the throat, all the muscles are enfeebled and relaxed. Moreover, the trouble does not end there, for the other organs present similar phenomena. The sensory, nervous system is disabled. In the alimentary canal, the paralyzing action occasions an exudation of water, as shown by the evacuations. Other signs are, outbreaks of perspiration upon the epidermis, and augmented renal excretions.

As regards epidemics; if an infectious disease pre-

vail in any place, and the germs of it be disseminated in the air, and drinking-water, there must be numbers of people into whose system they will gain admittance through the vehicles of food and drink, without necessarily inducing sickness. Sickness will be developed only when the condition of the body is favorable to the germs. Such a condition requires, first, that the bodily juices shall contain a certain percentage of water, for, if that be insufficient, the infection cannot take effect. This is the reason why, as shown in the essay on "The Causes of Disease," the process of hardening (water elimination) protects the body from infection. Secondly, the degree of vital energy in the tissues, especially in those of the walls of the intestines, which are first attacked by the disease germs, is an important factor. It will readily be understood that if the emotion or dread will set free within the body a noxious element, having power, as shown above, to paralyze all the living tissues, including the walls of the intestines, the same cause might suddenly annihilate the body's faculty of withstanding the poison of infection.

In describing the third condition—hitherto partly unrecognized—under which infection may be spread by epidemics, I am compelled to touch upon some uninviting themes. This is unavoidable, however, when writing on the subject of health-culture; for the source of many diseases will be found to lie in filth and other repulsive things, as to which an accurate knowledge is necessary if the diseases are to be effectually guarded against.

Physicians, and, indeed, some portions of the general public, have long been cognizant of the fact that

the effluvia emanating from water-closets, privies and cesspools, are dangerous to health, and that people who inhale such effluvia are very liable to take infectious diseases. Hence, at the outbreak of an epidemic, it has latterly been customary to make a thorough examination of these places, and to get them disinfected. But the lack of a clear understanding of the question has caused many to go astray in their measures of precaution.

For instance, it is generally supposed, (since infection has been known to proceed from living organisms,) that the offensive effluvia of water-closets and privies are not in themselves dangerous, but become so only when they contain these germs. That is an error. The mere inhaling of such effluvia will not produce cholera, typhus, or dysentery, but, if with the breath the effluvia enter the bodily juices, and thus pervade the entire system, their action will be identical with that of the mal-odorous, "noxious" principle. Liability to infection is thereby increased; and all that is needed for infection to ensue, is that the living organisms, however originating, should make their way into the body with the air, food or drink, which, during the prevalence of epidemics, may very easily occur. These germs might not have worked harm, had not the way for them been prepared by inhaling the effluvia. The reason why, I will give presently, but I must first explain one other circumstance, which has hitherto remained unnoticed.

The alimentary canal is the real source of the effluvia in question. Being extremely volatile, these emanations, while yet in the body, penetrate from the intestine into the bodily juices—a fact shown in every

post-mortem examination—and thence they issue by means of the cutaneous excretions. Their effect on the bodily juices in reference to epidemics, is the same as if they had been inhaled, and as that of the mal-odorous, “noxious” principle.

The essence of the foregoing statements is, that, between the effluvia engendered within the body and the seeds of infection, there is a definite relation; which relation I will now endeavor to explain.

Although every animal, and every plant, carries within itself every element that pertains to the nutrition of every living being, yet each individual will feed upon a special kind of nutriment, and in some cases upon a particular plant or animal only. This peculiarly applies to parasites; for instance, a dog-flea might find in the human blood whatever is required for its nutriment, but it has no relish for it; in fact, all vermin and parasites have their special appetites, and where these cannot be indulged, they will not thrive, nor even settle.

This is equally true of the germs of infection. They are parasites which in two respects have their special tastes. They settle upon one kind of animals only, or, at most, upon but few kinds. The cholera germs thrive upon man; but they are attracted by the mal-odorous, “noxious” elements of the body only, the opposite, fragrant, “salutary” elements not being to their taste.

NOTE.—The *salutary principle*, as here expounded by Dr. Jaeger, may be regarded as corresponding to, or as an explanation of, that state of the body which is the result of a well-balanced constitution, and that excellent condition of good health consequent upon

living in accordance with the laws of life. Cheerfulness, good humor, vital energy, vivacity, mental and physical vigor and robustness; activity, endurance of hardship, power to withstand climatic and weather influences, and to resist infection, are all comprehended in the one word *health*. Whatever difference there may be in terms or theory, the essential facts as stated by Dr. Jaeger, especially those relating to infectious diseases, are strikingly verified and illustrated by the following lines of Dr. *A. N. Bell*, editor of *The Sanitarian*, New York:

“ *The Rôle of Infective Microbes* is to battle with the physiological powers of the system which they enter, and to put it on the defensive immediately that they are distributed to the tissues of the body by means of the blood, which carries them to every part. If the system they enter be weak from any cause, constitutionally so, or feeble from recent disease; by reason of unhealthful surroundings, such as foul atmosphere, sudden exposure to excessive heat or cold without sufficient protection; deprivation of sleep; deranged digestion, or mental disturbance; above all, by debauch; in short, if by anything which disturbs bodily vigor, the microbes have the advantage—and they never fail to avail themselves of it—and generally overcome the power of resistance. It is not because they are cowards and only attack the weak; they attack the strong and the weak alike on every opportunity, but the strong—with all the functions of the body maintained in a state of vigorous health—are able to cope with the microbes and overcome them. The feeble, on the other hand, are taken at a disadvantage, and the more if the circumstances of their enfeeblement are in any degree maintained.

“ ‘The future of preventive medicine,’ said Professor Ray Lankester, in a lecture which he delivered at the London institution recently, ‘is the education of

the white blood corpuscle.' A corpuscle is a minute cell of protoplasm which floats in the human blood. 'This minute creature eats, and lives, and flourishes, and dies almost like a human being. Its special function,' said the lecturer, 'is to eat up the poisonous element which finds its way into the blood.' When a wound heals it is because these indefatigable corpuscles have found their way to the sore and have eaten away the injured part. When bacteria get into the system the duty of the corpuscles is to go for them and eat them up. If they succeed, the patient recovers. If they are out of appetite, or the bacteria too tough a morsel for them to attack, the patient dies. Sometimes, with unconscious heroism worthy of Marcus Curtius, they purify the bodies in which they live by eating up poisonous particles and then ejecting themselves, thus sacrificing their own lives. But such heroic self-immolation is not necessary, if you educate your corpuscle. His education proceeds by inoculation. By accustoming your protoplasmic cell to a low diet of mildly poisonous matter, such as the vaccine lymph, it becomes acclimatized, as it were, and is strong enough to eat up without inconvenience the germs of small-pox, which would otherwise prove fatal. It is these invaluable corpuscles which enable confirmed arsenic eaters to swallow with impunity a dose sufficient to kill six ordinary men.' Professor Lankester is of the opinion that they can be trained so as to digest the most virulent poisons and deal with a great number of diseases.

"With the foregoing suggestions, it is apparent that the indications in dealing with the microbe (infectious disease) are to strengthen the power of resistance to and combat with it in conjunction with the use of every available means of preventing and destroying the conditions favorable to its existence both within and without the human body."

What gives special value to these views of Dr. Bell, is the fact that they were written to illustrate and

emphasize the writer's opinion that woolen clothing is one of the most effectual means of securing and maintaining that condition of the body upon which health and all its attendant blessings depend.

The moral effects of these opposite states, are no less pronounced and conspicuous than the physical. The substance of this is thus given by Dr. Jaeger, in the closing paragraph of this chapter:

Every increase of the "noxious" principle in the body—no matter how and whence arising—creates a sense of dread, apprehension, discomfort, and oppression, or induces that condition in which the impressions of things and events, which would otherwise be indifferent, become a source of annoyance. Whereas, conversely, the lower the proportion of the "noxious" principle within the body, the more cheerful and joyous is the mood and the nearer perfect the equanimity. If anything arises to disturb the composure, the promptitude with which equanimity is restored will be according to the rapidity of the emanation of the "noxious" principle from the tissues, as I will explain further on.

THE NATURE OF DISEASE.

(1881.)

IN many cases, of the most various description, the cause of the disease will be found in the non-sanatory clothing and bedding, rather than in the body of the patient. It is an important fact that not only the so-called infectious diseases, that originate through germs, may be conveyed in the cloth-

ing, but also diseases with which germs certainly have nothing to do.

Clearly, when the cause of the disease is in the clothing or bedding, all medical treatment applied to the body only, is useless. There are cases which often seem desperate of cure; such as, to mention the simplest of them, the numerous nervous complaints, especially of women; the not less numerous diseases of the digestive organs, and chronic catarrh in the breathing passages. The cures, which the adoption of the Sanitary Woolen System works in these disorders, are sometimes called miraculous; but the only matter for astonishment is that these simple diseases have hitherto defied successful treatment.

A consideration of great practical importance, is that the faculty of conveying the whole class of diseases in question, extends even to subsidiary articles of clothing, such as handkerchiefs, chemisettes, aprons, etc., when the material is of vegetable fibre.

In assisting my readers to a deeper insight into the nature of these disease-poisons, and to the practicability of their being conveyed through the clothing, I assume their acquaintance with what I have elsewhere pointed out. Vegetable fibre has the faculty of retaining disease-poisons, which, however, do not remain in animal wool. I also assume that my readers remember my distinction between the "noxious," malodorous exhalations of the body which vegetable fibres absorb, and the "salutary," fragrant exhalations which animal wool attracts.

In order to understand the nature of disease, it will be well to inquire, In what does poison consist? The answer is, that *every thing*, even the salt which we

consume daily, and which is an important constituent of our bodies, can become poisonous. The question whether any substance is a poison or not, is simply one of quantity or concentration; and the reason why certain substances are especially termed "poison," is that such are poisonous in very small, while others are only so in very large, quantities.

Whatever the nature of this poisonous action, the ultimate consequence is, of course, the destruction of life; but the practical question is, how to tell whether a substance, if its action be unimpeded, will destroy life; in other words, what are the first effects of a poison?

The final effect of poison is death; *i.e.*, cessation of the voluntary (as well as of involuntary) movements. The *first* effect is the retardation of the voluntary movements in the body. Therefore, in order to know whether any thing is poisonous, it is sufficient to measure the rapidity of the simplest accustomed voluntary movement (for instance, the time required to effect a pressure with the finger several times in succession) at regular intervals of time; then the odor of the object under examination should be inhaled during ten to fifteen minutes, measuring meanwhile the rapidity of the finger-pressure every ten seconds. If the substance be a poison, the rapidity of the movement, either immediately, or after a preliminary increase of short duration, diminishes with a quickness in proportion to the dangerous nature of the poison.

Now arises another question:

There is no doubt that wild animals distinguish things which are poisonous from those which are not,

without the aid of a nerve-measure. How do they accomplish this? By smell. Here I must again diverge.

If from any substance soluble in water or spirits of wine, a series of solutions of different degrees of dilution be prepared, the test of the nerve-measure will show that some one of these solutions leaves the rapidity of the finger-measure unaffected. This may be termed an "indifferent" concentration. All more concentrated solutions, in proportion as they are more strongly concentrated, protract the finger-pressure, thus showing a poisonous effect. On the other hand, the more diluted solutions, in proportion to their dilution, quicken the finger-pressure; this may be described as an animating effect, which may be enhanced to a remarkable extent by continued diluting.

If the odor of each of these solutions be inhaled, that of the "indifferent" concentration will be found effectless one way or the other; the odor of the stronger concentrations, however, will be more or less repulsive, while the odor of the weaker preparations will be pleasant and fresh in proportion to the degree to which they are diluted.

Or another experiment may be tried. If a pleasant odor be concentrated, as by filling a room with strongly-scented flowers, before long the perfume will become repulsive. For this reason, flowers should not be kept in bedrooms. The sleeping person not only absorbs the oxygen of the air, but also its odorous elements; and the juices of the body will thus gradually be permeated by flower-perfume until a poisonous degree of concentration is reached.

If, on the other hand, a series of solutions of a

malodorous substance, of different degrees of concentration, be prepared, the odor of the strongly-concentrated solutions is offensive; then comes the solution of the "indifferent" stage, while the weaker solutions have a pleasant odor, which becomes finer as they are more diluted. Makers of perfumery are well acquainted with this fact, and manufacture the finest perfumes from most repulsive material. Again, the odor of a substance may, when first inhaled, be fragrant, and yet be poisonous—for instance, spurge-olive (*Daphne mezereum*) or prussic acid. The true effect, however, is felt if the inhalation of the odor be continued. Suddenly the fragrant impression is reversed, the odor becomes repulsive, and we know that the thing is poisonous. Observe the behavior of animals. If some unknown article of food be thrown to them, it is long and thoroughly smelled, exactly as I proceed when testing with my nerve measure. Only when, after prolonged inhalation, the odor remains pleasant, will animals venture to eat unknown things; and, if the odor changes, the thing is rejected. Therefore, an animal can be induced to take poison only when it is concealed in something with which it is familiar, thus being misled as to the necessity of testing it; or when the poison is so wrapped up or disguised that it cannot be smelled.

In short, poison is whatever has a repulsive odor, and all volatile matters smell repulsively as soon as, by inhaling them, their concentration in the juices of the body, exceeds a certain intensity.

With these preliminary remarks, I will now address myself to the solution of the question with which I started. The human body incessantly pro-

duces volatile matters which may be smelled. These odorous matters are not of themselves poisons, but normal, constituent parts, or products, of the body, which, indeed, when sufficiently diluted, may, from their animating effect, be very useful constituents of the bodily juices. They, however, become poisonous as soon as the degree of their concentration in the bodily juices exceeds a certain limit. Unsatisfactory clothing and bedding are quite enough to produce this degree of concentration, particularly in badly-ventilated rooms.

The lungs and the skin are constantly exhaling these odorous matters, which are readily absorbed by clothing made from material of vegetable fibre. The astonishing quantity of repulsive odor which such clothing will take up, may be shown by removing the cotton padding from under the armpit of a coat which has long been worn, slightly wetting it, and passing a hot iron over it.

If the odorous matters were firmly fixed in these textures, they would be less dangerous, but every minute increase in temperature, and especially every moistening of the material, causes them to evaporate.

A portion rises with the warmth of the body, and is again inhaled, and another portion mixes with the air under the clothes, interfering with the exhaling action of the skin. Thus the concentration of these odors in the juices of the body reaches a point at which they are poisonous and dangerous.

I must here refer to the tendency of clothes to absorb and retain odorous matters.

If, at night, water be placed in a dish or bottle in a closed, occupied sleeping-room, the water next

morning will taste and smell abominably. The popular explanation, that the water has lost something, is wrong. The water has become permeated with the poisonous exhalations in the room. This not only happens to water but also to all vegetable fibre in the room. The linen or cotton shirt, lying on a chair near the bed, absorbs these odors throughout the night precisely as the water does; and the same thing goes on in the drawers and cupboards in which the so-called clean linen is lying. It is generally thought that when linen has been washed, it must be clean; but scarcely has the linen, by washing and wringing, been made to yield up a part (by no means the whole) of the odors it has absorbed, and is neatly laid away, than it begins again, if placed in an occupied room, to absorb a fresh stock of poison, before it is worn. Let any one who doubts this, take a linen or cotton garment, which, after being washed, has thus been lying by for some time, or a linen or cotton curtain with which no one has come in contact; and he will find, if the garment or curtain be wetted and ironed, that an offensive odor will be emitted from it. The tendency of a substance to become more volatile in proportion to the warmth of the air, and inversely, to be precipitated or deposited somewhere when the atmosphere is colder, is partly the reason why the summer is a healthier season than the winter. In summer the odorous matters are dissipated in the air, where they are destroyed by electricity, or are washed by the rain into the ground, which readily absorbs them, or are consumed by the leaves of plants. In winter, on the other hand, these odorous matters sink, especially at night, when the room is

cold, into all materials of vegetable fibre, such as linen or cotton clothing, etc. A shirt, which was not so permeated with "noxious" exhalations as to have been unwholesome, when its wearer took it off in the evening, may attain this degree during the night, and when it is afterwards warmed upon the body, the mischief is let loose.

Conversely, the bed may, as long as it is occupied, be free from the above-named concentration, but the air may be full of odorous matter, which, if the window be not opened immediately on rising, will be deposited like unwholesome dew upon the materials of vegetable fibre in the bed, in proportion as the latter cools. When the bed is next warmed by the body of its occupant, the mischief is again let loose.

I would ask my German-lady readers what they suppose happens when the beds are placed daily, during summer, in the sun, as is the practice in Germany? If they do not know, I beg of them to use their noses, and they will find that the doubtful—if not offensive—smelling bedding has acquired, in the sunshine, a fresh, pleasant smell; and they will also find that the next night's sleep will be a most refreshing one. The sun, by expelling part of the odorous matter, has converted or diluted the poisonous degree of concentration, into a degree that is not poisonous, and the effluvia is rendered fragrant. The fragrance, however, is of short duration, as the old degree of concentration is soon reached again. But this is not so serious a matter at this season, (summer,) as the bedding can be again placed in the sun; but this cannot be so conveniently done in winter. Consequently, in winter, when the sparrow on the roof is

as healthy as in summer, many human beings, however cleanly, are, through the evil emanations from their beds, chilly, sickly, troubled with cough, headache, vapors, palpitation of the heart, rheumatism, and, perhaps, worse complaints still; out of humor, poisoned, and—poisonous. The simple remedy is, to throw away sheets, quilts, counterpanes, etc., to sleep in and on pure wool *only*, and to ventilate the room by opening the window before going to bed.

THE CRISIS OF DISEASE.

(1881.)

THE transition from the ordinary style of dress to the Sanitary Woolen System, is sometimes attended with phenomena which doctors designate “critical,” as indicating a turning point. These “crises,” which may occur soon, or some time, after the change of clothing, running their course in a few hours, or enduring for a longer period, and involving greater or less disturbance of the general health,—have caused persons, that did not understand them, to discard the Sanatory Woolen Clothing, especially if the “critical” periods had lasted any length of time. In place of the improvement that was expected from the adoption of the System, people conceived that it made them ill.

Healthy persons who need nothing beyond the elimination of superfluous tissue-water, find that the “crisis,” as a rule, is confined to one or more copious outpourings of perspiration, occurring in rapid succession, and in a few weeks the full benefit of the

Sanitary Woolen System is realized. But where there is a chronic disorder—be it only a constitutional susceptibility to colds and chills—the case is altered, and for the following reasons :

The earlier physicians believed that in cases of acute disease and chronic disorders, some special, “morbid matter” must be expelled before the patient could recover. They were familiar with the kind of “crisis” which heralds convalescence, but is preceded by exacerbation of the symptoms; and they termed the attendant secretions, which, as a rule, appear in the form of perspiration, “critical secretions.” They could not, however, explain more precisely the nature of this “morbid matter.” The modern school of physiology rejected this theory, or recognized it only in epidemic diseases, and ceased to give the same attention as formerly to the “crisis” of disease.

My researches confirm the earlier views of the profession on this point, and show that the odor of the “morbid matter” exhaled by the patient, is characteristic of the particular disease, thus admitting the practicability of recognizing a disease by the sense of smell.

I could say much more on this subject, but will confine myself here to the following remarks.

As I have frequently explained, every living creature, even when healthy, evolves “noxious” emanations from its food and from the decomposition of albumen in its tissues. If these emanations can be freely eliminated, they do no harm, but if their discharge from the body be checked, they will accumulate within, creating what medical men call dyscrasia, an ill-balanced temperament, or a morbid condition

of the constitution, or a bad condition of the bodily juices. The same thing will happen in an atmosphere constantly laden with offensive emanations, whether originating within the body, or from any other source. The albumen of the tissues attracts such emanations, and becomes impregnated therewith.

Lack of exercise especially favors this process of absorption, rendering sluggish the interchange and conversion of the constituents in the body, the tissues of which then as readily take up odorous exhalations, as standing milk is known to do.

A person whose tissues are thus overcharged with "noxious" emanations may not at the time feel unwell, for the emanations, are, in a manner, chemically combined with the albumen in the tissues. It is the decomposition of albumen, consequent on increased activity of the organs, through some stimulating cause, that liberates the "noxious" emanations, which then become odorous, and illness sets in. The tendency to this is accentuated by the effect of the "noxious" emanations in rendering the tissues more spongy, increasing the quantity of water in them, and furthering decomposition.

The next is a very important point for laymen as well as doctors, and I beg my readers to give it their best attention.

According to my observations, many "noxious" odors, by direct action upon the skin, and by penetrating into the bodily juices, produce contraction in the cutaneous blood-vessels, and thereby excite a sensation of cold, because the skin in such cases receives a smaller amount of blood heat. The same will happen if, internally, a "noxious," volatile es-

sence be set free. That is the reason why many illnesses are ushered in with a shivering fit. If this be very pronounced, and, so, closely followed by the so-called febrile fit, by way of reaction, the effect of the volatile, odorous essence above mentioned, is no other than the hitherto unaccountable, feverish shivering. But if the reaction is delayed, and there be only a moderate degree of shivering, the patient will probably say that he has caught a cold, even when there is not the faintest trace of a cause for the chill. Hence comes that very general view of chills as prime causes of illness, and the consequent nervous dread of catching cold, which has wrought, and is still working, so much mischief.

To return to the question of the "crisis." The Sanitary Woolen System has by this time fully approved itself as one of the most powerful, if not, indeed, the most powerful, curative means for dyscrasial habits of body; for the reason that it possesses the faculty of expelling the volatile, dyscrasial matter from the body.

What is the inference? A person predisposed to take cold is one whose dyscrasy or "noxious" essence, is characterized by a special tendency, whenever set free, to induce a chill. If, by the help of the Sanitary Woolen System, this odorous essence be suddenly expelled, the "crisis" will run its course as an apparent fever caused by a cold.

It must be remembered that the "noxious" emanations, in cases of dyscrasial or distempered habit of body, are greatly diversified; and, consequently, the symptoms characterizing these "crises" must be as dissimilar as are the maladies themselves.

In conclusion, I may state that although I have now been wearing the Sanatory Woolen Clothing for the last two years and a half, it was not before the past winter that a certain troublesome irritation of the skin between the shoulder blades quite disappeared. I had been saddled with it for fully seven years, especially during the cold season, and, in fact, it showed even two winters ago, although only as a mild kind of evanescent rash. Therefore, I say, patience ! The "salutary" principle which clings to woolen garments—nature's healing power, or the body's own medicine—will overcome everything, unless indeed internal, anatomical changes have taken place. Care, however, must be exercised that the remedial action be not interfered with by the "noxious" principle of the body, which adheres to textures of vegetable fibre.

I am satisfied that many who have adopted the Sanitary Woolen System, and who may read this, will call to mind their own early experiences. These remarks will clear up much that may have seemed unaccountable; and it will now be better understood why opinions of the System may, at times, have been diametrically opposite, according to particular cases and circumstances.

When I was first told that a person had tried the Sanitary Woolen System and could not stand it; I was prone to conclude that there must be constitutions with which it did not agree; although I rebelled against such a supposition as an obvious paradox. Now, however, since I better understand the character of the "crisis," I no longer entertain the slightest doubt. The Sanitary Woolen System agrees with everybody, without exception, and the very persons

whose bodies make the hardest fight against it will ultimately derive the greatest benefit from it. The struggle is proof that "morbid matter" is lurking in the body; and, although for a time this may not cause actual illness, there is a consciousness of imperfect health, which shows itself in this, that, and the other minor ailment; and sooner or later its development is attended with serious, perhaps fatal, results. The reader will, therefore, readily perceive how a "crisis," when misunderstood, may give rise to seeming contradictions in the minds of those who claim to have given the System a fair trial.

THE DEODORIZATION OF THE BODY.

(1879.)

ONE effect of the adoption of the Sanatory Wool-
en Clothing and Bedding, both in my own case and in that of all persons experimented upon, is very confirmatory of my teaching, and is not devoid of interest from a practical point of view. This effect I may call the *deodorization* (or sweetening) of the body. Where surrounding conditions tend to check evaporation, the watery vapor given off by the body is likely to be tainted. Frequent ablutions, and change of linen, will reduce its offensiveness, but complete purification and deodorization can never be effected unless by means of the Sanatory Woolen Clothing and Bedding, and of open bedroom windows at night.

The evils imputed to woolen underclothing by several professional men—among whom I may mention

the famous HUFELAND—such as weakening, and irritation of the skin, are not imaginary, but very real, *when cotton or linen shirts are worn over woolen materials*; or when cotton or linen linings to the waistcoats, coats, etc., are retained; whereas, if nothing but woolen upperclothing and underclothing be worn, all grounds for such objections disappear.

It may serve as a hint to other novices in the Sanitary Woolen System, to state that several persons have written to me, that during the first few days following the putting-on of the Sanatory Woolen Clothing, the skin gave off a copious secretion, described by some as noisome, by others as sticky, necessitating a frequent change of shirt; but that, very shortly, this action ceased, and the shirt acquired, and continued to retain, the pleasant “salutary” odor.

The lesson to be learned by the reader from these cases is, not to take alarm if, upon adopting the Sanitary Woolen System, he should, at first, have an experience like that described above; but, on the contrary, to regard it as a sign of a wholesome change, since the full benefit of the System cannot be realized till all such morbid matters, or secretions, shall be expelled from the body.

Now I come to another practical point. I mentioned before, that water-closets and privies had long been under suspicion of causing and facilitating the spread of infection, and that on this account, certain regulations had been suggested in connection with the subject of *Disinfection*. It was thought that the use of disinfecting fluids would kill the living organisms of infection. Soon, however, it was discovered—and the botanist NÆGELI confirms the discovery in his book,

noticed in a previous essay—that in most cases these germs are not killed; but that the fosse, pipe, or drain is simply freed from offensive smells; *i. e.*, “deodorized” instead of being disinfected. This was, therefore, accounted a useless proceeding, as merely doing away with the unpleasant impression produced upon the nostrils; and Professor NÆGELI holds the same view, which, however, according to my researches, is wrong. No doubt, the complete extermination of the disease germs, by a process of disinfection, would be preferable; but deodorization affords the very great advantage of putting an end to those offensive effluvia, the inhalation and collection of which in the body, predisposes it to take infection. The nose is truly the sanitary sentinel. We should follow its warnings, and avoid every kind of stench; attacking the cause with the utmost energy by deodorizing, at any rate, if complete eradication be impossible. Stench alone will not cause illness, but protracted inhalation of tainted air induces a state of body favorable to the development of disease,—particularly infectious disease.

Here, perhaps, I should say a few words with reference to a fact, confirmed by incontestable statistical accounts, in apparent contradiction to my teaching. Laborers and others engaged in sewer work, whose occupation compels them to pass their lives in an atmosphere heavily charged with sewer gases, enjoy almost perfect immunity from such epidemic affections as small-pox, cholera, typhus, etc.; but, in discussing this point, I fear I should need to assume too much familiarity with scientific details on the part of my readers. I shall, therefore, be content to say

that the above fact is not only in accord with my teachings, but it supplies another proof of the position that the presence or absence of certain odorous elements in the bodily juices, will decide the question as to whether the body is, or is not, susceptible to contagion. I will refer to the fact only that the effluvia arising from newly-voided ejecta, emit a very different odor from that of sulphureted hydrogen, etc., emanating from foul drains. The first-named odors are more dangerous, because they induce liability to infection; the latter, on the contrary, as secretions of the ferment of putrescence, are analogous to the germs of infection themselves; and act, when in a higher state of concentration, as preservatives against the seeds of infection, upon the same principle that inoculation with cow-pox matter, protects against infection from the congeneric germs of human small-pox.

The power to resist the influences of temperature, I formerly attributed entirely to the elimination of the superfluous tissue-water; but my further investigations have convinced me that the deodorization of the body has also a share in it. My conclusion rests, among other grounds, upon the phenomena observed, in the pursuit of my researches, on the other section of the causes of disease—that is to say, on matter by which infection is conveyed. I have not made exhaustive experiments specially directed to the elucidation of this question; yet what has come under my notice, incidentally, is instructive, and must, as I judge, prove interesting to others.

The reader is aware that the so-called catarrh of the respiratory organs, (particularly in the form of

colds and coughs,) is one of the complaints most frequently and easily communicated. Formerly the members of my family and myself frequently contracted catarrh. A child would bring it home and pass it on to the rest; or visitors, suffering from colds and coughs, would convey the contagion by means of the customary embrace. This winter, however, although opportunities were not wanting, no one in the house was infected; but I observed, more than once, that, after being with a person suffering from cold, all the symptoms of an on-coming cold and cough would become manifest. There ensued sneezings and fits of coughing, but instead of the usual preliminary feverish stage and dry throat, succeeded by much watery mucus, subsequently changing to thick phlegm,—expectoration set in at once, and the matter was ended.

On one occasion one of my children came home from school complaining of indisposition and faintness, which he had first felt when in school. While a warm drink was preparing for him, the boy vomited, and an hour later he was out of doors again. The matter brought up did not show that the child had eaten anything calculated to disagree with him.

It has happened more than once that, in the evening, a member of the family would exhibit such symptoms of serious illness as feverishness, headache, dry, hot skin, and languor. But nothing was done beyond administering a glass of strongly-sugared water; and no real illness broke out, the patient invariably recovering by the next day.

That a capacity for resisting infection has been acquired, is confirmed by the following observations

which I have made. In former years my children, especially during the first year of school attendance, brought home every kind of infectious disease that made its appearance in the school. My youngest girl went to school for the first time this winter. Opportunities to catch various complaints have been plentiful; for, more than a third of the children in her class were away at one time on account of illness. My little one, however, brought home no sickness, and went through the winter, like all the rest of us, exempt from any ailment. Further, the two children of a neighboring acquaintance, who are constant companions of my two little ones, have had the whooping-cough since the commencement of the winter; and that is well known to be catching. As might be supposed, intercourse between them was consequently restricted; but, to my certain knowledge, they met quite frequently enough to communicate the complaint; yet, although my children had never had the whooping-cough, they did not catch it from their playmates. Of course, these observations, by themselves, would not form the basis of any decisive opinion; but, taken in connection with all my other experiences, and the general conditions of infection; they possess, to my mind, sufficiently conclusive evidence to warrant the following succinct explanation of the change which is effected in the body by the agency of deodorization.

The malodorous humors within the body act upon the nervous apparatus in a manner similar to that of dust on the machinery of a timepiece, retarding its motion and rendering it irregular. The immunity of the body from extraneous influences, whether of

heat, cold, or infection, will depend upon the prompt intervention of that which the doctors term "reaction," and which takes its rise in the nerves. This is the force, provided it operate betimes, that should avert illness in the shape of cold, inflammatory action, or infection; while, if the reaction be too long delayed, the mischief is done.

As regards infection: the absence, as previously explained, of the particular odorous elements favorable to the propagation of the germs, will tend to prevent them from effecting a speedy lodgement. Thus, the reaction of the hardened body, casts out the agent of cough and catarrh infection, by means of a prompt secretion of mucus, ere it can secure a footing. Anything injurious which may enter the stomach, is removed by immediate vomiting. Exposure to cold, at once causes a more active transmission of blood to the integumentary vessels, with the result of kindling warmth in the skin; while, in an overheated room, or in front of a blazing fire, the blood-supply in the skin is forthwith diminished, thus preventing the disagreeable sensation of undue warmth.

This view is confirmed by other observations on the members of my own family. Stomach, heart, lungs, and brain all manifest greater vitality. My wife and myself, until lately, had very deficient digestion, and we needed to use much caution in the matter of indigestible dishes; now, on the contrary, we can venture upon all sorts of food without the slightest inconvenience. The heart-beats in my own case have long been too quick, numbering eighty-four per minute, when I was perfectly still; but, for the last

few months, I reckon seventy-five per minute—the normal number of beats for a man of my age—and, under the strain of exertion, no such increase takes place as occurred before.

Last year my repeated attempts at gardening miscarried, owing to rapid heating and perspiring, and fatigue in the arms; but now, although I had no practice through the past winter, I can do several hours' digging and hoeing without strain. In short, each bodily function is freed from influences which previously hampered its action.

SANATORY WOOLEN CLOTHING.

(1879.)

THE body has the peculiar property of maintaining its possession of fat, tissue-water, and other fluids or humors. It takes advantage of every careless movement, every opportunity, however apparently insignificant, to repossess itself of that which has been wrested from it. This is a familiar experience as regards fat. Corpulent persons, wont to resort to the waters of Carlsbad, or to some other kind of anti-fat regimen, no doubt lose a few pounds on every occasion; but as soon as the special treatment is relinquished the fat will reappear. I experienced this in my own person when I began my researches on the subject of health-culture. Every powerful remedy adopted produced a slight diminution in the measurement round the body, but as soon as the special treatment was suspended, my former size returned. At present, however, I am really

master of the situation. In a few months my measurement round the body permanently receded to the extent of about $5\frac{1}{4}$ inches, while the weight per liter-volume of body bulk, rose by 15 grams; (or $1\frac{1}{2}$ per cent.;) and my flesh, in point of firmness and hardness, resembles that of the most seasoned soldier. Nor did it require any special effort to bring this about; for the entire change, including the elimination of superfluous water and the liberated emanations from the tissues, has been accomplished by the adoption of a *suitable change in the system of clothing*, combined with thorough ventilation of the living-rooms and sleeping-rooms, and with—in my own special case, where the elimination of fat presented the chief difficulty—four pedestrian tours, each lasting several days.

As regards the clothing, several points require consideration. First, comes the material of which it is made. I have already shown that animal wool meets the requirements of health-culture to a much greater extent than fabrics made of vegetable fibre, (such as linen, hemp and cotton,) in consequence of the much greater impermeability of the latter to watery vapor. The German proverb, describing a healthy, comfortable man as one “sitting in the wool,” goes to show that popular usage is in this particular in advance of science; and it is indeed hard to understand how linen and cotton should have so long and so extensively held their ground as clothing materials.

The rate at which this question has been maturing within the last decade, is instructive, and important to the right apprehension of the practical deductions and suggestions which I have to make.

My own earliest practical application of wool was, to advise persons subject to colds to wear a strip of flannel next to the skin, from the chest down to the stomach; and some benefit was certainly derived from the experiment. Next followed the use of under-vests, and finally of woolen shirts, worn under white shirts. This was an error. The body was indeed protected from cold, but at the same time enervated; and the woolen shirt, placed between the outer white shirt and the body, soon became moist with perspiration, and disagreeable. For this reason many doctors pronounced against the use of woolen shirts; but this was again an error. Not the woolen shirt, but the overlying white shirt produced the evil; and it should have been discarded. I recognized this fact in the year 1868, and at once made my opinion known. Then came the Franco-German War, 1870-71, and the experience gained in it opened up a wide career for the woolen shirt, although the mistake of wearing a white shirt over it was still made. I now find, however, that the evil is not due to the linen shirt alone,—that is to say, the mere discarding of the linen shirt from over the woolen undershirt, is not sufficient,—but that *all* linen and cotton material in the clothing, not excepting that used for lining and stiffening coats, etc., and for pockets of coats and trousers, is pernicious to health. The clothing should be made throughout of pure, animal wool. How astonishingly susceptible the body is to the benefits of this, I have had many opportunities to observe in my own social and family circle.

When I came to rightly understand the matter, I began the correction by substituting woolen for the

linen or cotton linings. This could not be effected all at once, and some coats that were held not to be worth the extra expense, were to be worn out to the end with the old lining. However, if one of us after wearing an altered garment for any considerable length of time, put on one not altered, he immediately experienced, with more or less distinctness, that feeling of uneasiness which arises from incomplete evaporation of the "noxious" emanations. This would pass away, but the general condition of the body changed for the worse. The mood was less equable, and the tendency to take cold was greater. These symptoms disappeared when the coat, made entirely of wool, was resumed.

Similar experiments were instituted so frequently, and were so invariably followed by like results, that all doubt as to the accuracy of my researches, was removed. My readers can test the matter for themselves.

The material, however, is not the sole consideration; the *cut* of the clothing must also be taken into account. I may state generally, first, that the clothing will be the better for fitting quite tightly, so as to allow the least possible movement of air between the clothes and the body; and, secondly; that it should be twice as thick along the middle line of the trunk, from neck to abdomen, as at the sides or back.

Among the various kinds of coats now generally worn by men, all such as cannot be made to close right up to the neck, and to fit compactly to the figure, should be laid aside as wholly unsanatory. An examination of the interior of an old coat, will reveal

an astounding quantity of rubbish secreted under the lining for purposes of padding, stiffening, etc. This becomes saturated with the malodorous, "noxious" emanations of the body, which freely evaporate under the influence of heat or moisture.

I should now like to say a word on women's dress, but I approach the subject with a certain degree of diffidence; for, with women, habit and prejudice are even more potent than with men; and I have to declare war against such cherished finery as silk dresses, white petticoats, (often starched so as to make them thoroughly impermeable,) linen stays, cotton or silk stockings, and white, starched dresses, which inclose the whole body like a glass cover. Then, again, women are so fond of their store of linen; take such a delight in the diversion afforded by interminable washings, and ironings, and starchings, that I fear they will condemn me as a disturber of domestic peace, as one bent upon creating a cheerless waste in the laundry and press-room. Yet, seeing that my own wife has not only become reconciled to the new order of things, but that she declares she would not willingly revert to the *status quo ante*, I will venture to proceed. Chemise, stockings, drawers, petticoats, and stays should all be made of pure, animal wool. These, with a dress of pure woolen stuff, closing well round the throat, and having a double woolen lining at the chest and downwards, should be the winter and summer wear of women, who would then participate in all the advantages which I have described, and of which they more than men, stand in need.

UNDERVESTS.

(1878.)

I AM asked to express my opinion of the well-known network undervests, because it appears that in many quarters these undervests are highly spoken of, and are recommended as preferable to the Sanatory Woolen shirt.

The two articles of clothing can hardly be compared. The network undervests are intended to be used only as *undervests*, and their action will greatly depend upon the material of the shirt which is worn over them; whereas the Sanatory Woolen shirts should be used alone, and this important difference must be taken into account in pronouncing judgment.

The case stands thus :

If a linen or cotton shirt be worn with an undervest, the network is preferable to a flannel undervest. But if it be asked whether linen or cotton shirts, with the network underneath, should be worn. or the Sanatory Woolen shirt *by itself*, without other outer covering than the coat ; unquestionably the decision must be given in favor of the latter arrangement.

This opinion is founded upon a careful consideration of the services which the clothing should render to the body. First; it is required to keep the skin uniformly warm; secondly; it should offer a free outlet to cutaneous exhalation, which mainly consists of watery vapor; thirdly; it should gently titillate and rub the skin, in order to maintain a constant and ample blood supply; fourthly; it should assist,

instead of hindering, the self-cleansing process of the skin, which consists in the shedding of the outer cuticle.

We will now inquire how far the methods of clothing in question, answer to these requirements.

1. Should a network or flannel undervest be worn underneath a linen or cotton shirt? As regards the first requirement, (the maintenance of uniform warmth,) there is hardly any difference; but as to the second, (the escape of the cutaneous evaporation,) the network offers decidedly the least hindrance. The air under the clothing can move outwards and upwards more freely than when a flannel undervest is worn, as not only are the open spaces of the network much greater than the interstices of the flannel, but they are also too large to become blocked by the excretions from the skin. In relation to the third point, there is no material difference, since the knots of the network and the minute hairs of the flannel supply the necessary stimulus for the skin. With regard to the fourth requirement, I should say that the network is preferable to flannel undervests, because the latter soon become sticky and greasy from the above-mentioned condensation of the cutaneous evaporation into water, causing the epidermal scales, which, when the skin is dry, scale off, or are easily rubbed off, to adhere to the body.

2. Which is better, the Sanatory Woolen shirt alone, or a linen or cotton shirt with a network undervest? In relation to the first of the above-named requirements, (the maintenance of warmth of the skin,) linen and cotton are objectionable because they are much better heat-conductors. As touching

the second point, (and this is the most important,) the single woollen shirt deserves the preference. It is not the network undervest, but the white outer shirt which prevents the escape of cutaneous exhalation, on account of its close web and of the vegetable nature of the fibre; (and both these objections apply to linen with even greater force than to cotton;) again, the starching of the white shirt front renders it practically impervious to watery vapor, at the very spot where the evaporation should most easily proceed—that is, at the chest and neck.

Hence, the superiority of the Sanatory Woollen shirt, in respect to the last of the four above-named requirements, is clear. By dispensing with the practically impervious white shirt, the cutaneous vapor is no longer condensed, and the skin keeps dry, so that the scales readily come away; while the countless fine hairy points of the wool will conduce to the cleansing of the skin far more comprehensively than the much fewer and too coarse knots or links of the network.

THE SANATORY COAT.

(1878.)

I DESIRE particularly to emphasize a feature of the Sanatory Woollen Clothing, which, in my own personal experience, has been truly astonishing. It was first suggested to me by the excellent results of the application, in medical practice, of the “Reglin” poultice to the front middle line of the body, from the pit of the neck to below the navel. The

remarkable relief thus afforded from the blood-pressure, is due to the terminal convergence in this region, of all the blood-vessels in the trunk of the body, and to the considerable enlargement of their areas, consequent upon the stimulating action of the poultice. This is tantamount to the expansion of the minute blood-vessels of the entire surface of the trunk; and, as upon their size depends the measure of evaporation, it follows that their expansion will cause the skin to give off watery vapor more freely and rapidly.

This shows that particular attention should be paid to the covering of the middle line of chest and stomach—that is to say, this part should be kept *warmer* than other portions of the body's surface; an end easily reached by means of a double-breasted coat, similar to that worn in the Würtemberg regiments. The two sides of the coat are made to overlap, thus ensuring a double covering to this part of the body. This plan for maintaining extra warmth, operates similarly to the Reglin poultice. The double covering ensures a more abundant blood-supply for the entire skin, and the vapory, cutaneous exhalation thereby produced, can easily escape where the coat is only of one thickness. To this end two conditions are indispensable.

1. The coat, be the weather ever so warm, should at all times *be kept buttoned all the way up*, as prescribed in the Army. Those to whom this may seem irksome, will find it so only at the very first. Every soldier will bear witness to the comfort of the buttoned-up coat.

2. Beneath the coat, neither waistcoat nor white

shirt should be worn, but simply the Sanatory Woolen shirt.

In short, I may say that the double-breasted Sanatory coat is the most conducive to health, because it hardens the body in a remarkable degree, while it, at the same time, affords the best protection. Coats so constructed are certainly the most elegant and most healthy wear for men.

Now I pass on to my personal experience. I have been wearing the coat as above prescribed for the last eight weeks.* On several previous occasions I had striven, with no little perseverance, to cure myself of a debilitated bodily condition, taking Turkish baths, active exercise; carefully ventilating my rooms, dieting myself, etc., but with only partial success. For instance, the measurement round the stomach, where the size chiefly indicates the deposit of fat, shrunk from $37\frac{3}{4}$ to $35\frac{3}{8}$ inches only, whereas the normal measurement should not exceed $29\frac{3}{8}$ inches. During the holidays, indeed, I had at times succeeded in reducing it to $34\frac{5}{8}$, but, in spite of all, it rose again to $35\frac{3}{8}$. During the first few weeks the Sanatory coat itself had little effect; but, when the weather grew warm, the superfluous fat began to disappear, at so rapid a rate that the measurement round the stomach at this time is only $32\frac{1}{2}$ inches; while my fitness for work and my general health have improved in a corresponding degree. My pre-conceived theory was therefore verified beyond my most sanguine expectation; for, having regard to the ill-success of former endeavors, I did not look for so early results.

* Written in 1878.

THE GERMAN GYMNASTIC SUIT.

(1879.)

WHEN I commenced my studies on the subject of health-culture, some ten years ago, I stumbled against a paradox which long puzzled me, and of which I have only now found the solution. It related to the question of the value to be attached to gymnastic drill in regard to health-culture.

The more I investigated the conditions pertaining to the maintenance of health, and the power to withstand morbid influences, the more strongly did I feel convinced that gymnastic drill must be conducive to health. On the other hand, I could not shut my eyes to the fact that members of German gymnastic clubs or schools, when compared with other people, are in no way so much more healthy as might be expected from the deductions of scientific investigation.

People with whom I have discussed the subject, would call to mind the case of this or that enthusiastic gymnast, of their acquaintance who had died prematurely. Especially suggestive were the cases of two well-known Stuttgart gymnasts,—one of whom died of pneumonia, the other of dropsy. I am well aware of the fact that no measure of health-culture can perpetuate existence; but that both these men should have died in the prime of life, appeared not to lie within the natural order of things.

I now know, or, to speak more modestly, I believe that I know, the reason of the notoriously ill success, sanitarily considered, of the German system of gym-

nastics. The material unfortunately selected for the regulation, gymnastic suit, not only impairs the usefulness of the tempering and hardening of the body, which should result from gymnastic drill—in that it renders the effect merely transient—but it is actually a source of danger. That gymnasts do not possess well-hardened bodies, may be seen on any visit to a gymnastic festival.

Very exceptional exertion should be necessary to wring copious perspiration from a man who is properly “trained.” The strain on gymnasts at festivals, where they rest after each of their brief exhibitions, is not of a kind to cause perspiration in men in thorough training; and yet how much perspiration is shed at gymnastic matches, notwithstanding the light costume! Not only are the shirts soaked, but the outer-clothing too is stained with perspiration.

A chill will readily strike inwards when the skin is covered with perspiration, and it has a no more adequate protection against chills than that afforded by a white shirt and a duck jacket saturated with wet. Further, if we consider the energy with which the proper training “form” is counteracted by liberal potations of beer, we shall no longer wonder at the sanitary failure of gymnastic drill, nor at the passive resistance offered to it by the majority of the public. For these reasons I am anxious to impress upon all gymnastic clubs and associations, that it behooves them, both in the interests of individual members and in that of their otherwise most excellent cause, to remedy the evil pointed out.

The bad effects of faulty clothing in school gymnastics, will also be apparent from the foregoing.

THE ATMOSPHERE OF SCHOOLROOMS.

(1879.)

ALTHOUGH the badness of the atmosphere in overcrowded schoolrooms is a somewhat hackneyed subject, I purpose to treat of it here, because the results of researches detailed in the previous essays, not only clear up much that has hitherto been unexplained, but also furnish us with several practical hints.

The reader will recall my explanation of the relation of the odorous elements of the body's exhalations to the emotions or mood, and the distinction which I make between the "salutary" and the "noxious" principle. According to the degree in which the former or the latter predominates, the mood will be cheerful and equable, or depressed and irritable.

The effect of interfering with the free passage of these emanations from the body by a wrong system of clothing, and bedding, has, so far, chiefly been kept in view; but there are other aspects of the question which have not yet been touched upon.

First: the quantity of these emanations present in the blood, is increased when they are inhaled from an atmosphere that is laden with them.

Second: the exhalations of the body are entirely different, according as the mood is cheerful or depressed.

When the mind and the body are at rest, the exhalations principally consist of the emanations which arise from the food during and after digestion.

These belong to the "noxious" class, and their accumulation, in badly-ventilated bedrooms, for instance, accounts for the depressed, irritable mood which is frequently experienced on waking from sleep. These emanations are practically unintermittent, but as soon as the emotions are called into play, they are either combined with the "salutary," or with further "noxious" emanations, according as the mood is cheerful or the reverse.

When a teacher tyrannizes over his pupils, and terrifies them, the "noxious" emanations evolved by the digested food are combined with those induced by the emotion of dread; and the atmosphere of the schoolroom will be much more rapidly and effectually charged with "noxious" exhalations than they will be when the teacher handles the pupils so that they are not in constant fear and dread, but in a state of equanimity and composure.

The "noxious" emanations exhaled by the terrified children, are inhaled by all occupants of the room, not, of course, excepting the teacher himself. This condition of things tends to render the teacher feverish and irritable; while the effect on the children is to paralyze and confuse their mental powers, and to destroy their control over what they do know;—they cannot think; they become excited, and "lose their heads." Thus, no one escapes the evil influence of the increasingly deteriorating atmosphere, and the schoolroom becomes a purgatory both for teacher and pupils. That, in spite of all severity and punishment, less will be learned than if the atmosphere had been pure, is self-evident.

From this may be deduced three rules:

1. The greatest care should be given to the ventilation of the schoolrooms. Let the teacher remember that, otherwise, he will be punished by the bad effect upon his own temper.

2. Teachers should not treat their pupils roughly, or so as to terrify them; but in a friendly, encouraging, even cheering manner. If, for instance, they can arouse the children's laughter by a joke or witticism, the distraction will do no harm; on the contrary, the "salutary" essence thus released will lighten the labor of learning, and its exhalation will have a beneficial effect upon pupils and teachers alike.

3. There should be no school held after dinner, while digestion is going on; because then the "noxious" emanations are freely evolved, and quickly corrupt the atmosphere of the schoolroom. As much can be done in one hour before, as in two hours after, dinner.

SUMMER AND WINTER CLOTHING.

(1879.)

WE have had to wait for the summer, but within the last few days it has set in in earnest. The newspapers have chronicled many cases of sunstroke, both among civilians and in the army; while the number of those who sigh and perspire under the infliction of the sun's rays is legion. How does the heat affect people clad in wool and the Sanatory coat?

According to my own experience, and the communications received from others, I can answer that

the Sanatory Woolen Clothing has, for us, acquitted itself splendidly. Not but that we, too, have perspired; nor that we perspired much less—assuredly not more—than others, but because the perspiring is effected much more easily and opportunely; that is to say, before the perilous thickening of the blood sets in, which in extreme cases causes apoplectic fits. Here I may mention that it is a mistake to suppose that it is a tenet of the Sanitary Woolen System to keep on the coat uninterruptedly, even in the greatest heat. On the contrary, a follower of the System, may do that which people with the ordinary style of clothing hardly dare do.

After freely perspiring, the coat may be removed without fear of the consequences, and with considerable refreshment. This is a privilege which others cannot enjoy for fear of taking cold.

I advise wearers of the Sanatory Woolen Clothing not to seek relief from intense heat by unbuttoning or opening their coats. The relief is only felt at first, and soon changes into a feeling of an opposite character, for the partial cooling along the middle line of the chest quickly interferes with the body's power of evaporation. The only correct plan is either to take the coat off, or to retain it closely buttoned up. In walking, when the heat is great, it is unquestionably better to keep the coat closely buttoned up. At first, the perspiration will pour out freely, although it will soon cease, unless, indeed, the weather be exceedingly sultry. But, when the destination is reached, the coat may at once be removed, thus reversing the practice of wearers of "vegetable-fibre" clothing, who may march in their shirt-sleeves,

but must put on their coats when they rest, if they would guard against catching cold.

I have considered the question of summer and winter clothing at some length, and have found that it cannot be disposed of off-hand. If we turn to the feathered and the hairy animals, we shall find that not all of them by any means alternate light, summer clothing with thick, winter clothing.

Among hairy animals, otters, beavers, and others that are amphibious, make no such change; neither do the natural inhabitants of the desert; for I never observed anything of the sort among the antelopes and wild asses at the Vienna Zoölogical Gardens. Lastly, no such change, as a rule, takes place with birds. Thus, among animals provided with a special vesture, those most liable to exposure and climatic influences, do not vary their clothing with the seasons. The only hairy animals with which the change is really marked, are those that live in the woods and fields; and that fact is quite intelligible.

When the woods are thick with foliage, and the fields lie under growing crops, these animals find themselves no longer in the open air, but buried in the covert, and surrounded by a damp atmosphere, which greatly impedes the evaporation from the surface of their bodies. Nature has, then, placed these animals under a covering of leaf and grass, and the body naturally endeavors to lighten its clothing. When autumn scatters the leafy and grassy coverings, the case is reversed, for, then, heavier coats must counteract the exposure. With animals not subject to such alternations of external conditions, and with the majority of birds, especially those always on

the wing; this change of coat does not take place.

In our climes, civilized man must be compared with the birds, rather than with the animals of the field or forest. For, like the birds, both in summer and winter he is in the open air; and, even when indoors, he is surrounded by dry walls, and not by plants constantly throwing off watery vapor. Therefore, observation of the animal world does not teach us to change our clothing according to the season.

The conclusion will be substantially the same if we consult men leading a comparatively natural existence. The shepherd opines, "that which is good for cold protects against heat," and puts on his cloak when he feels too hot. In Hungarian pasture-lands the shepherds wear the sheepskin bunda both in summer and winter, with the difference that in summer they turn the woolly side out, and in winter, in.

As regards my own experience I may say that, last summer I wore rather thick coats, and came through the heat quite comfortably. This summer I passed in a lighter dress, but I perspired much more. I will not positively say that this was due to the thinner coat; for, owing to the excessive moisture, it was a very "perspiring" summer, but the above experience certainly did not indicate a change of coats in summer and winter.

To test the correctness of this view of the matter, I questioned other wearers of the Sanatory Woolen Clothing, and found that their experience coincided exactly with my own. At times they perspired considerably, but decidedly less than in former years, and with greatly diminished annoyance.

INHALATION OF DUST.

(1879.)

THE introduction of the so-called dust into the respiratory passages is, under certain circumstances, a frequent and not insignificant cause of disease; especially when the body's power of resistance is impaired. I may instance a case in point, which is instructive, as showing how illness may originate; and, therefore, what precautionary measures should be taken.

Last autumn a change in the direction of my eldest son's studies, required that he should overtake class-mates who had been studying Greek for the last four years; whereas he had done no Greek before. Notwithstanding my endeavor to meet the effects of this extra strain by prescribing a specially invigorating diet; notwithstanding, too, that my son wore the Sanatory Woolen Clothing; all the symptoms of over-exertion presented themselves: as, diminished mental energy, defective memory, loss of equanimity, bodily exhaustion. Another instructive symptom, as bearing upon my former elucidations of the subject, was the remarkable diminution of his specific weight. At the end of the autumn holidays, his specific gravity registered at 1,111 grams, and when I weighed him again at Christmas, it had fallen to 1,060. This low bodily condition continued through the winter school term, and in the spring the following-mentioned events occurred:

My little garden in the course of the winter had been twice dressed with liquid manure; and, when in

the spring, we set about digging up the ground, the dry weather had set in. The clods had become as hard as stones, so that we had to pulverize them, which, with a strong east wind blowing, raised a great quantity of dust. I myself, my eldest son and one of my daughters, engaged in the work; and we all were exposed to the inhalation of this dust highly charged with manure. The consequence, to my daughter and myself, was a somewhat violent and obstinate catarrh; but quite unattended with fever; and we were able to continue our usual vocations. My son, however, fell ill with a species of severe influenza, and was completely prostrated for ten days. I then allowed him ample time for recovery, and his convalescence proceeded so favorably, that by midsummer, his specific gravity had risen to 1,127 grams.

This case, besides bearing out my doctrine of epidemic immunity, goes to show that the same description of dust which will produce general constitutional derangement when the powers of resistance are impaired, will excite local irritation in the air-passages of the lungs only, when the body is properly hardened. Thus the condition of body established by the Sanitary Woolen System, although it may not afford absolute protection against the injurious consequences of dust inhalation, will certainly render them less dangerous; in proof of which, if time and space permitted, I might adduce a whole series of further observations.

It does not follow, however, that we should neglect to remove the dust from the atmosphere which we breathe; for, even a harmless catarrh can hardly be

reckoned among the pleasures of existence; while continual inhalation of dust, such as people in certain trades are exposed to, may effectually sap the foundations of health. Still, followers of the Sanitary Woolen System need feel no more apprehension respecting the inhalation of injurious dust than they feel with regard to colds and epidemics. But those who, in despite of timely warnings, obstinately persist in clothing their bodies in fabrics of vegetable fibre, must be content to bear the ills of which they deliberately incur the risk.

CATARRH.

(1879.)

WHEN a new, practical sanitary measure is discovered, inquiry must be made not only as to what it can accomplish, but also as to what it cannot accomplish. I mention the incident which I shall presently relate, because I have had repeated proofs that a very general preconception lies in the way of a clear understanding of the subject of catarrh.

The preconception referred to, is in the form of a belief that every cough and cold in the head is directly referable to what is called catching cold. If that were so, people who adopt the Sanitary Woolen System, should never suffer from cough or catarrh; otherwise my doctrine that the sanatory clothing renders its wearers independent of the influence of the weather, would be incorrect.

Repeated experiments have clearly shown, that the Sanitary Woolen Clothing System, when properly and

completely carried out, does protect against chill. As, however, the experience of myself and others, shows that cases of catarrh will occur—generally of short duration, though occasionally violent—I have investigated each instance of the kind, with special reference to its cause.

The chief subject of the investigation, is the mucus issuing from the nose or mouth. In such examinations, I have generally found the cause of the supposed catarrh to be some intruded, foreign body. Corpuscles were either directly visible to the naked eye, or the gray color of the mucus pointed to the soot or smoke inhalation; or the microscope would reveal the presence of what is generally termed “dust.”

I will, however, recount a particular instance, because it illustrates another not uncommon preconception.

During my holiday tour, I was awakened suddenly, one night, by a violent fit of coughing, that lasted for fully ten minutes. Eventually I coughed up clear mucus, which was deposited on a plate previously wiped for the purpose. After repeated expectoration the irritation in the throat moderated, when I again lay down. On looking up at the ceiling, the air in that direction seemed to me close and confined, and the inclination to cough came back again.

This was a sufficient hint, and I turned my head towards where the fresh air was streaming in through the open window, when I was soon sound asleep again. Next morning I discovered that the wall-paper near the ceiling was mouldy, and in the collected mucus I could distinctly perceive gray particles of dust. Unfortunately, I had not a magnifying glass by me, to

ascertain decisively whether these were of the nature of white fungoid moulds or not.

The reader may possibly ask what there is remarkable in this occurrence. Everyone knows that persons will cough when something gets into their throat. And yet, the case is worthy of remark, for it shows how, if the body is thoroughly hardened, the respiratory organs, at once, and powerfully, react when dust is inhaled, and continue to react until the disturbance is removed. But a debilitated constitution is incapable of such reaction; the throat cannot assist by means of the needful secretion of mucus; there is a dry cough for two or three days, but no dislodgement of the disturbance; and, when the flow of mucus finally sets in, the organ is already affected. Those whose bodies are hardened by the Sanitary Woolen System, sneeze and cough occasionally with great force; but very quickly the necessary loosening of mucus takes place.

Had what happened to me in that hotel, befallen a man clothed in vegetable fibre, he would probably have contracted a thorough catarrh, and would have accounted for it by saying that he must have caught a cold from the open window.

THE SHIRT, THE TROUSERS, AND THE HAT.

(1879.)

THE ordinary shirt—not of double thickness in front, and opening down the middle—is altogether unsanatory; especially when worn at night, or not under the closely buttoned-up coat. The blood recedes from the skin, and if this continue, or cir-

cumstances be in other respects unfavorable, the constitution, even when the body is not actually chilled, will suffer a loss of vigor in consequence of diminished cutaneous action.

I have therefore caused a shirt to be designed, which is of double thickness over the chest and downwards, and fastens on the shoulder. This pattern presents a sanatorily perfect shirt, in which people, even when divested of their coats, and under unfavorable conditions, may go about in safety, as I can testify from numerous experiments. In devising this plan and shape, I did not overlook the female sex, who attach so much importance to fashion in dress, that the application of the fundamental principle of the double covering of the chest to women, can be ensured only by properly and tastefully constructed chemises and nightdresses. As regards the choice of fabrics, after very careful consideration, I gave the preference to stockinet webs. They are more porous and supple, and on that account more durable, while they feel more comfortable to the skin, and are less liable to shrink than flannel.

As to the trousers: Until very lately my instructions related to the *material* only, I insisting that it should be wool alone, but various observations which I have made on the subject have convinced me that the *form* must be taken into the account: that is, the trousers should be so cut and fastened as to continue the middle line of extra warmth so as to include the abdomen. I advise every one to make the change, especially those who need to melt away superfluous fat, or persons subject to disorders of the stomach or digestive organs.

As regards the hat, two points call for consideration. It should be made of animal fibres, without lining of cotton, or linen, or leather; but instead of the latter, a strip of felt should be inserted, or else the hat should be quite devoid of lining, like a Turkish fez. (No one who has tried the woollen felt lining in the hat will care to revert to a lining of leather.) Not only are the fashionable, hard hats bad on account of their imperviousness, which impedes the transmission and evaporation of the perspiration from the scalp, but for the reason that the shellac used in stiffening them has an injurious effect; this is not the case with the cherry gum employed in the make of soft beaver hats; and old beaver or felt hats can be altered to conform to the principle of the Sanatory hat. To those who are bald or are threatened with baldness, or profusely perspire through the scalp, or suffer from headache, I especially recommend the Sanatory Woollen hat.

[The editor of this edition of Dr. Jaeger's Health Culture, has worn the Jaeger hat, winter and summer, for over five years,—often taking long walks during the hottest of the weather,—and not once, during that time, did he have cause to take off his hat to wipe the perspiration from his forehead. It seems never to occur to the wearer that the wiping needs to be done, the forehead being always warm and dry in winter, and cool and dry in summer. The perspiration is absorbed, as rapidly as it exudes from the skin, by the porous felt; is at once transmitted to the outer surface, where its evaporation, by neutralizing the

heat, keeps the temperature down to a comfortable degree of coolness. If Dr. Jaeger had given to the world nothing but his Sanatory hat, he would be entitled to the honor of being called a public benefactor.

Although a person may be overcome by heat, attended with great exertion, it may well be doubted whether the wearer of the Jaeger hat could be a victim of sunstroke, in the proper sense of the term.]

NORMAL DURATION OF HUMAN LIFE.

(1879.)

A FRENCH naturalist first pointed out that domesticated animals live from five to six times as long as the time required to grow to full size. A horse, for example, is fully grown in four years, and remains fit for work up to the twentieth year, as a rule; dogs of the larger breeds, grow from one-and-a-half to two years, and live to the tenth year; and the same law obtains among other hairy animals the limit of the ages of which can be estimated.

That the rule also holds good in reference to man, may be learned from tribes living in a wild state. The native Australians, for instance, perhaps the nearest perfect specimens of men in a natural condition still extant, reach their full stature between the tenth and twelfth years, becoming old at from fifty to sixty. Properly speaking, they never ail, and are singularly free from epidemic disease; their life being such as to have an especially hardening effect on the

body, as they go quite naked, and build themselves no habitations.

Considering, therefore, that, in our climes, full growth is attained, on an average, at about the eighteenth or twentieth year, the normal termination of life should be at the ninetieth or hundredth year. That, potentially, we are endowed with such longevity, is shown by the isolated examples, of centenarians of both sexes, met with in every calling and every country. Consequently, putting accidents aside, we must conclude that death, when occurring at a less advanced age, is the direct result of the unnatural mode of life adopted by civilized man; partly, indeed, on compulsion and without any fault of his, but, to a great extent, through ignorance or carelessness. In some cases the foundations of disease are laid in childhood, through improper methods of rearing, while in others a debilitated constitution is hereditary.

It is, therefore, evident that much remains to be done in the interest of a national system of health-culture, both publicly and individually; and it is certainly a cheering sign of the times that, within the later decades of the present century, this important task has been taken up in the most various quarters in a manner heretofore unknown.

Many will be alarmed at the idea that all, or even a large percentage of mankind, should live to so great an age; for, as it is, the progressive increase of population in Germany is proportionally greater than that of the supply of food.

This is, so far, correct, and the extraordinary prolongation of life of all weakly persons, might seem to

work hardship to the bread-winners, who must support them. But, if health-culture be devoted to raising the standard of working capacity, such fears will speedily vanish. To the man who is capable of work and whose body is hardened, the whole world lies open, nowadays, and there is room for the further dissemination of the human race for centuries yet to come.

DIPHTHERIA.

(1880.)

THE maxim which obtains among students of nature, that an isolated case does not warrant general conclusions, is perfectly sound; yet when such an isolated case tallies with a theory supported by a whole series of facts, such as that which I have put forward respecting immunity from epidemics, it must have more than the ordinary weight of a single fact.

I have stated my conviction that, judging from all appearances, the Sanitary Woolen System should afford protection against diphtheria. And a case of this complaint, lately occurring under my own roof, confirms the accuracy of my surmise.

The reader may remember the case of my eldest son, who, owing to several months' severe application to study, lost specific weight in a very remarkable degree, and then contracted influenza. This time my report refers to my youngest boy, six years old, whose attendance at school commenced only last October.

As with most young birds on first quitting the nest,

the new life proved a heavy cross to him, and for weeks there was weeping and wailing; he was troubled, and he cried whenever he had to start for school. In addition, I must mention that, whereas his classmates had had a year's teaching in the infant-school, and could therefore read and write a little, my boy knew absolutely nothing, and consequently was obliged to work exceedingly hard to get abreast of his companions. After a few weeks the same symptoms supervened as those occurring in the case of my eldest son previously mentioned: the flesh turned flabby, he complained of fatigue after a quarter of an hour's walk; (although, in the previous summer, he had quite manfully walked for seven hours with me one day;) was peevish, cried often and long; and the exhalations were almost always offensive,—suggesting the “noxious” principle.

Last week he began to cough, and when, a few days after, I came to examine him, he presented a complete case of diphtheria. The continuous development of the “noxious” principle had overcome the influence of the Sanitary Woolen System against disease, exactly as it had in the case of my eldest son. Still, the little fellow kept up, and the attempt of my wife to make him stay in bed, was entirely in vain; there was never any trace of fever; and, after I had touched up the throat two or three times, the child was quite himself again.

Convinced that the other members of the family would enjoy full immunity, by virtue of the Sanitary Woolen System, I did not isolate the lad, but merely forbade him to kiss anyone. Three days after the discovery of diphtheria in the boy, my youngest

daughter, nine years old, complained of a tickling sensation in the throat. An examination revealed no signs, and therefore I did not interfere. In the afternoon she said she felt unwell, and on finding her slightly feverish I sent her to bed. A few hours later she vomited three times at very brief intervals. Next day she was still somewhat out of sorts, and I then ascertained that the bowels had not been moved on that nor on the previous day. This was soon remedied, and she has since been perfectly well. No one else in the family showed any signs of sickening on this occasion.

From the above case I believe that I am justified in contending that diphtheria is subject to the same law as cholera, typhus, the plague, dysentery, and small-pox; and that those who adopt the Sanitary Woolen System, and guard against excessive mental exertion, need not fear infection; or, should they take it, the disease will be mild and free from danger.

I have made similar observations with reference to measles and chicken-pox. In these cases, the disease caused no derangement of the general health, and passed off after the second day.

THE CLEANLINESS OF THE SANITARY WOOLEN CLOTHING SYSTEM.

(1880.)

THE worst kind of dirt is that which is most offensive to the senses. That linen and cotton, whether worn as underclothing or used for coat-linings, etc., acquire an unpleasant odor, may easily be ascertained; so that even persons who put on clean

shirts every day, must continue unclean in one respect, for the coat-lining that cannot be washed will constantly give off its offensive smell. In this respect the Sanatory Woolen Clothing need cause no fear on the score of uncleanness, as it acquires and retains a pleasant smell. When the clothing has been worn some time, it may be laid in the sun, or shut up with camphor,—when it will soon be found to have parted with any excess of emanations which it may have absorbed from the body through long-continued wear.

Then, there is the dirt that takes the form of dust, which settles in woolen garments more readily than in others; but this is compensated for by the fact that it can also be more easily removed. A linen dress covered with dust, must go to the wash; whereas brushing and beating will take out all the dust in woolen clothing.

Dirt, in the form of grease from the animal fat secreted by the skin, appears only when the Sanatory Woolen shirt has been worn for an unduly long period; because it does not retain the cutaneous secretions with the tenacity that linen or cotton shirts do. This brings me to the consideration of the dirt that accumulates on the skin. Respecting this, woolen shirts are truly incomparable. While, on the one hand, shirts made of vegetable-fibre material, attract all the dirt of the skin, converting it into a species of grease to be again deposited in a crust; on the other hand, the Sanatory Woolen shirts brush off the dirt in the form of dry dust so effectually that, in a fairly pure atmosphere, the body looks and is as clean as though fresh from the bath.

To sum up: everyone is unclean who neglects to wash when dirty; but everyone is clean who *avoids dirt*; and, as the body collects much less dirt in the Sanatory Woolen Clothing than in cotton or linen, the inference is clear that, other conditions being equal, wearers of the former are much cleaner than those who, adhering to material made from vegetable fibre, literally *stick* to cotton or linen shirts.

THE COLLAR.

(1880.)

RESPECTING the collar, my experience has been somewhat singular. It is an old maxim, especially of anxious mothers, that the neck should be well protected; and many people would sooner go barefoot than with the neck unprotected.

I had never paid much attention to the subject, although I had had considerable trouble with the throat at one time or another in my life; but, when I discovered the principle of the Sanitary Woolen System, I logically assumed that the throat required no special care, and I therefore discontinued wearing a neckerchief. And I made no change on account of sundry ailments of the throat from which I have suffered within the last year and a half; because such affections recurred at much greater intervals, and were milder in character than formerly, excepting one particularly obstinate cold caught last spring. Over this I pondered a good deal; for, it permanently injured my voice and thereby greatly interfered with my chief pleasure—sitting down at home at the piano

and singing a song. Since last spring the voice had retained a persistent hoarseness; the higher notes became impossible at times, and my voice frequently broke down altogether.

My attention was first directed to the subject of the clothing of the neck when I discovered that, unlike the Sanatory Woolen shirt, my linen collar very soon became malodorous. From that moment I regarded the linen collar as an unclean thing, and considered how it could be replaced by a woolen substitute.

Frequent inquiries encouraged me in the prosecution of my purpose; but I regarded the whole thing as rather insignificant; and when I first put on my woolen neck-covering, consisting of a cloth cravat and a white cashmere collar, I felt disposed to laugh at myself for riding a hobby; but was pleased to find that the contrivance did not look unsightly. Of course I at once felt the comfort of the wool, but I did not foresee anything more.

On the very next day, however, I felt that the condition of my throat had much improved; and, from time to time, I expectorated loose phlegm without cough or effort of any kind. When, some days after, I first attempted to sing again, my daughter remarked that my voice sounded plainer and clearer than ever. I had noticed it myself, without attaching any particular importance to the change, because it had previously occasionally varied from better to worse. A few days later I again tried, and my voice was, in the first song, as clear as it had ever been after a quarter of an hour's preliminary practice. This was quite a new experience; but it did not stop

there, for I found that my voice had increased its compass.

At my best, G had been the highest chest note, and in falsetto C; whereas, now, B came easily from the chest, and in falsetto E, which I had never previously been able to accomplish. The cleansing or clearing of the throat by the secretion of mucus continued; and there was no further disturbance, the voice remaining uniformly good, whereas, in former days, even prior to that excessively severe cold, it was always unreliable.

Perspiration freely exudes at the point where the collar touches the neck; and the linen collar, which readily takes up moisture, whether of perspiration or of the atmosphere, becomes, in consequence, damp and chilly, and a common source of throat disorders. It is therefore of the highest importance to clothe the neck with material, such as animal wool, which will not invite a chill; a truth well attested by the frequent use of woolen wrappers and comforters. The latter, however, may be superseded by the Sanatory Woolen collar and cravat; and I strongly recommend every one to make the change for the benefit of his throat.

SILK.

(1880.)

I HAVE often been asked to express an opinion as to the merits of silk for dresses, etc. After a careful investigation of the properties of silk, I have been forced to the conclusion, that, as touching the

main point,—its relation to the odorous principles,*—it is open to the same objection as that urged against the vegetable fibre fabrics.

* [To those who are not entirely *en rapport* with Dr. Jaeger, respecting the “odorous principles,” it may be well to say, that it is not necessary either to understand or to accept his theory on this point, in order to appreciate those “properties of silk,” which render it objectionable as a material for underwear. *Positively* it is the equal of wool as a non-conductor of heat and electricity; *negatively*, it is the inferior of wool, from its lack of all the other qualities which go to make the woollen fabric the material *par excellence* for the clothing of the human body. The chemical constituents of the two essentially differ. The composition of wool is almost identical with that of gelatine, so large a constituent of the animal tissue. The elements are, $C_{41} H_{67} N_{13} O_{16}$.

Silk consists of three substances; a thin outer layer of gelatine,—soluble in water; next, a layer of albumen,—soluble in acetic acid on boiling; and third, a nitrogenized substance called *sericine*, which is soluble in neither water nor acetic acid. *Sericine* is the chief substance of spider's thread.

Although it is as good a non-conductor of heat as wool, it, other conditions being the same, is not so good a protection against changes of tempera-

ture. In common phrase, it is not so *warm* in winter nor so *cool* in summer. This is due to the fact that it has not the repulsion for water, nor the attraction for vapor, that wool has; nor the affinity for air—properties and conditions so ingeniously combined, and adapted to the physiology of the human skin, that it would seem as though nothing short of infinite wisdom could have disposed them so wisely.]

IS WOOLEN CLOTHING WEAKENING?

(1880.)

ONE who desires to adopt the Sanitary Woollen System, has asked the question whether he can, without danger, continue to take a cold bath every morning.*

As this inquiry shows how deep-rooted is the prejudice which ascribes weakening effects to the wearing of wool, I will now take the opportunity of discussing the misapprehension indicated by the above heading.

This prejudice is founded upon the fact that a person, who has worn a woollen shirt beneath the customary clothing of mixed materials, and who, at the commencement of the warm season, substitutes a linen or cotton shirt for it, very easily catches cold. The simple explanation is, that the action of the wool

* See "Cold Baths," p. 137.

predisposes and accustoms the body to a certain distribution of the blood—that is to say, more blood circulates near the surface and less internally. Linen or cotton clothing has a contrary effect, as it drives the blood from the skin inwards, thus creating a very important disturbance of the previously subsisting equilibrium. The malefactor, therefore, is obviously not the woolen, but the white shirt; whence it plainly follows that the woolen shirt should be constantly worn. It will be asked why such simple reasoning has hitherto been generally overlooked. The answer is, that when, at the commencement of summer, woolen shirts were felt to be hot, no other alleviation was thought of than to lay them aside until the following winter. Here, again, this feeling of oppressiveness was not caused by the woolen shirts, but by the cotton or linen linings to the coat and waistcoat. I perceived that these must be banished from the coat. When I first determined to wear my winter coat and woolen shirt through the summer, I found them inconveniently hot, and I hit upon the idea of cutting out *the linings of the coat*, instead of laying aside the woolen shirt; with that, the Columbus egg was made to stand.

Instead of weakening, the action of wool is entirely the reverse; the tendency of the woolen garment is to harden and strengthen the body. The only condition indispensable to the maximum result is, that the wool shall be *in sole possession*. By overlaying a woolen shirt with vegetable fibre in the shape of coat-linings, we produce a state of things in the perspiratory system similar to the deadlock caused by hitching horses to both ends of a cart. The cart will not budge.

Half-and-half woolen clothing does not harden the body, and if its wearer, in his "untrained" condition, should exchange the Sanatory Woolen shirt for a linen or cotton one, he will be fortunate if he escapes without an illness during the transition stage.

The flesh of a man clothed entirely in wool is strong and firm. If he undress in cold weather, the blood, driven for a moment from the surface towards the interior, promptly returns to the skin, affording the necessary counterpoise to the cold.

THE CURATIVE POWER OF WOOL.

(1880.)

HITHERTO, discussion of the Sanitary Woolen System has been confined to its preventive virtues, and to its relation to the sense of health and capacity for work, mental and physical. Recent experience, however, has distinctly shown it to possess curative power in a quite unexpected degree.

My reason for refraining so far from publishing such experiences, in spite of many requests that I would do so, has been a reluctance to expose myself to the risk of being reviled as a quack doctor, pretending to work miraculous cures with a universal panacea. For the same reason I now refrain from instancing particular cases and maladies by name, and treat of the subject merely in general terms. Intelligent readers will not fail to extract from my remarks that which may be useful to them.

It is well known that in sickness, the exhalations are offensive as compared with those given off in

health. A second fact, noticed in my researches, and now fully substantiated, is that the feeling of indisposition, or generally deranged condition, is caused by the presence of "noxious" exhalations, and if these can be dispelled the indisposition is removed.

A third fact is that the most safe and effectual means for the dissipation of such exhalations, is an abundant cutaneous evaporation, aided by clothing that will not hold offensive emanations. The Sanatory Woolen Clothing supplies both these desiderata; hence it is a remedial agent in every general constitutional derangement, and *permanently* renders the service which is sought from cold water cures, Turkish baths, gymnastics, etc., where the object aimed at is, in reality, the promotion of cutaneous evaporation, which, however, when thus procured, can be *temporary* only.

A familiar mode of treatment in the removal of solid or fluid morbid deposits from the body, is that which doctors term counter-irritation, wherein it is endeavored, by the most various means, to bring out the disease through the skin. The Sanatory Woolen Clothing does this most effectually, because it permanently establishes a more abundant blood-supply over the entire integumentary surface; and in this diversion of the blood to an outward direction, relieving the internal pressure, wearers of the Sanatory Woolen Clothing may find an explanation of the reduction of accumulated fat which they soon experience. Now, that which applies to excess of fat holds good of other useless deposits in the body.

There is, further, a series of internal disorders—especially of the abdominal organs—which, if not

directly caused by, are yet associated with, an abnormal distribution of the blood, that is to say, an inordinate determination of blood to these organs. The Sanitary Woolen System is also highly beneficial in these cases through its tendency to attract the blood to the skin, and thus to relieve the internal parts of the body.

On the other hand, Sanatory Woolen Clothing retains those "salutary" emanations of the body which induce a sense of vigor and sound health. These constitute the most energetic and certainly the most wholesome of remedial agents; and may be not inaptly termed the body's "inherent medicine." The best drugs which chemists supply do not agree with every patient, because constitutions differ. A doctor who is unmindful of this law, and neglects to study the constitutions of his patients, runs the risk of working much mischief. No such risk attaches to the "body's inherent medicine;" it is that element which, in medical schools, formerly went by the name of *vis medicatrix naturæ*, or nature's healing power, and to which the physician appeals when art no longer avails to save a patient. I have explained that the Sanatory Woolen Clothing collects and stores up this healing power of nature, an instance of the popular faith in which, is the practice among the poorer classes of taking off a woolen stocking to wrap it round the neck in cases of sore throat.

In most instances the change from ordinary to Sanatory Woolen Clothing, proceeds quite smoothly, but in several cases which have come to my knowledge, it has been attended with the appearance of

what may be termed a "crisis," * which is the effort of nature to expel from the body any disease located in it. Under the stimulus of the Sanatory Woolen Clothing, the skin copiously exudes "noxious" perspiration, which again subsides, leaving behind a most pleasant sense of health and comfort. The practice of sleeping with the window open in all weathers, a practice which should never be relaxed, is especially salutary during a "crisis," as it promotes the free dispersion of the "noxious" emanations which the body exhales.

In short, the Sanatory Woolen Clothing is a curative agency as powerful and effectual as any of the so-called constitutional methods of treatment. In cases of dyscrasia, where distempered humors have to be dispersed, crises of a more important character may take place, as in other methods of cure. But it would be folly to be discouraged on this account, and to relinquish a remedy which will effect a *permanent* cure if the System be adhered to.

PROGRESS OF THE SANATORY WOOLEN CLOTHING REFORM.

(1880.)

IN the prosecution of this far-reaching reform, it is necessary to be ever on the watch to combat and refute prejudices, rooted in the hitherto sanctioned modes of dress and hygienic tenets; to turn the assaults of an opposition which proceeds from persons interested in the linen and cotton industries; and to correct constantly-recurring mistakes made by

* See "The Crisis of Disease," page 57.

the general public in their adoption and practical utilization of the Sanitary Woolen System, referable to imperfect apprehension of the subject.

It may interest my readers if I here give a summary of what has so far (1880) been achieved. Introduced two years ago, my Sanitary Woolen System has already taken root in all European countries, as well as in the United States, particularly in Germany, Austria, and Finland, where, in every town of any size and importance, many now wear the Sanatory Woolen Clothing. Of course, the greatest progress has been made in my own Swabian district, where, by means of lectures delivered in the chief towns, I have succeeded in firmly establishing the superiority of the new system of dress, to that of the old. Next to Swabia, ranks Bavaria; while in the North German States, I understand it is in Hamburg that the System has found most adherents.

With the extensive experience thus acquired, objectionable features of the original designs for the various articles of clothing, have been eliminated: and difficulties connected with the choice of material, nature of web, degrees of thickness, cut and make, etc., have been overcome. I will not assert that nothing further remains to be done on these various points; but much progress has been made and many improvements have been introduced.

Extensive experience, too, enables me to state that the beneficial effects of the Sanitary Woolen System, as originally tested upon a comparatively small number of persons; (which effects I summed up as power of resistance to weather, disease, and the influence of the emotions, together with an important enhance-

ment of the mental and physical capacities;) can be realized by persons of both sexes of every age and calling; provided they will faithfully observe the three fundamental rules; namely, to wear the Sanatory Woolen Clothing; to sleep in and on wool; and to keep the bedroom window open at night.

The objections urged against the Sanitary Woolen System, that it involves the danger of uncleanness; that it tends to debilitate; that it is unsuitable for the season;—have not only been shown to be theoretically untenable, upon grounds intelligible to every one with the least claim to technical knowledge, but they have also been refuted by the evidence of well established facts.

I would ask impartial readers to note that I do not desire the truth of my statements to be taken for granted; but rather that a thorough and fair trial should be made of the Sanitary Woolen System, uninfluenced by long-established custom or prejudice. Especially would I caution the public against coats not made *throughout* of pure woolen material. Readers will be astonished, if they examine the interior of their coats, at the quantity of evil-smelling rubbish, especially when damp, that they will find there.

My attention has been drawn, on more than one occasion, by experts in the wool trade, to the fact that, besides interweaving entire cotton yarns into the fabric of buckskins or other stuffs, an adulteration that is easily detected, many more fraudulent practices are resorted to; such as spinning cotton together with the wool, so as to increase the tenacity of the yarn, and thereby facilitate the process of working in

considerable quantities of the cheaper, short-stapled wools. My informants stated that, as the percentage of intruded cotton is small, the imposture is undiscernible to the naked eye, and hence such stuffs are frequently palmed off upon buyers as all-wool material. I have recently had proof that the above statements are perfectly correct. I examined, under the microscope, thirty-six cuttings of buckskins, which, in the opinion of highly experienced men of business, were pure, all-wool cloth; and I found that six of these cuttings—or about seventeen per cent, contained some admixture of cotton. True, it did not exceed one or two per cent, but it had escaped observation. If the alcohol in wine contains one per cent of fusel oil, the wine is unwholesome; or if a pastrycook uses in one baking a hundred eggs, and only one of the hundred is addled, the whole baking is tainted. Woolen material adulterated with ever so little vegetable fibre is a parallel case.

VARIATIONS OF TEMPERATURE, AND SUNSTROKE.

(1880.)

IN No. 212 of the *Neue Züricher Zeitung*, Dr. MAYENFISCH writes, in an article on "Mountain Climate," as follows: "Many think to harden the body by seeking to do without extra clothing in the cooler hours of the morning and evening, but this folly must be dearly paid for. The skin promotes or checks the evolution of heat in sympathy with the surrounding temperature; but as it cannot adapt

itself to sudden leaps and bounds of temperature it must be assisted by the clothing. When the temperature is low, the clothing should be warmer, while in high temperatures, lighter garments should be worn, which, too, may be loosened and opened to facilitate the throwing off of heat. The impediment to this function offered by the closely-buttoned military uniform, when troops are massed in columns, and the consequent accumulation of heat in the body, cause the frequent cases of sunstroke witnessed on the march or on parade. Let every one, therefore, put on warmer clothing in the early morning and after sunset."

I will now express my view on the subject. The statistics for the whole German army, on which I based my researches on the preservation of health, cover a period of six-and-a-quarter years; and these instructive returns go to show that, among an equal number of men, the deaths from sunstroke were thirty-four among recruits, twenty among soldiers of two years' service, and only six among those of three years' service. Hence, it would appear that, in addition to the buttoned uniforms, massed columns, and consequent heat—the causes of sunstroke, according to Dr. MAYENFISCH—another very material element must be taken into account, viz., the degree to which the body is hardened.

The probability of a fatal sunstroke with a thoroughly seasoned soldier of three years' standing, is six times less than it is with a recruit. If, therefore, the Sanatory Woolen Clothing have the effect of hardening the body, it must proportionately tend to protect against sunstroke. Some cases of sunstroke

occurred in our Würtemberg Army Corps in the middle of last August. On the very day of these casualties—a day of most intense heat—a party consisting of myself, my wife, my boy, (six years old,) and my son-in-law, walked from half-past nine to twelve o'clock to the Federsee Lake, along the Schussenried and Buchau road, entirely without shade. We went upon the lake in a boat during the hottest part of the day—two till half-past four o'clock—exposed to the scorching rays of two suns, one from above, and the other reflected from the water,—my son-in-law and myself rowing nearly all the time. We went through the day in high spirits, the holiday mood never forsaking us for a moment, and in the evening returned home on foot by the same road, after a most enjoyable excursion.

In the case of wearers of the Sanatory Woolen Clothing, the limits referred to by Dr. MAYENFISCH, between which the skin can perform its function of heat evolution, are very much enlarged, so that only those whose bodies are clothed on wrong principle, need lay to heart the advice about morning and evening dress. The former, if so minded, may reverse the usual order without incurring risk. They may walk with coats buttoned up in the hottest part of the day, and may enjoy the German national game of skittles in the evening, exposed to the strongest draughts, playing in their shirt-sleeves; in fact, that is just what I did myself on our return to Schussenried on the occasion referred to.

THE WOOLEN GLOVE, AND STINGS.

(1880.)

AMONG the fruits of a foot tour just brought to a close, is an observation in respect to stinging-flies; and, since the newspapers periodically fill the air with lamentations about the mosquitoes, I need make no apology for here communicating my experience.

Not every one is alike sensitive to the stings of gadflies and gnats. I myself belong in a very special manner to the sensitive class. On the spot where the sting is inflicted, there rises an itching tumor which plagues me for weeks. Two years ago I noticed that the swelling, together with the itching sensation, very soon disappeared, if the wound were scratched with a small knife, sufficiently to draw a drop or two of blood. Obtaining relief in the same manner on several subsequent occasions, I have since made it a point in summer time, as soon as the flies make their appearance, to carry a vaccinator's lancet for the purpose above indicated. This year I have discovered another remedy.

First, I was stung in the hand by gadflies, three times in rapid succession, on my journey home from Hohenheim. Simply with the idea of preventing further stings, I pulled on my woolen gloves. To my surprise the itching sensation was allayed in a minute or two, and the trouble was at an end.

On our pedestrian excursion, I had further opportunities to observe the like effects, three times on my own person, and once on my daughter. My wife and

daughter, who had been in the habit of wearing cotton gloves in summer, assured me that a gadfly or gnat, stinging through a cotton glove, inflicts very great pain indeed. This reminded me that I had also suffered greatly when stung through the white linen trousers of former days.

On another occasion I struck my hand against a stinging-nettle, and as this, too, causes me very great annoyance, I resorted to my woolen gloves, with the same excellent result. Gnats paid us a visit on two nights during our travels; several of us heard them buzzing, felt the sting, and found the swelling in the morning. I had six lumps on the legs, which were very troublesome and much swollen; but scarcely had I put on my closely-fitting woolen breeches when lumps and itching had gone. Such close-fitting breeches, made of stockinet, are quite as good a remedy and protection against stings as woolen gloves. Loose trousers, made of cloth or buckskin, cannot act in the same way, in spite of the woolen material, because they move backwards and forwards, and thus irritate the wound. Stockinet cloth *breeches*, on the contrary, cling tightly, and therefore do not rub against the part which has been stung.

(To the foregoing may be added that bee-keepers have testified to the protection afforded by woolen gloves in cases of stinging.)

Thus, in a field of observation which I should never have imagined would repay the trouble of thought or study, is again clearly revealed, on the one hand, the protecting and remedial virtue of wool, and on the other, the baneful effects of cotton. Now, too, I was reminded of something which had always been a mys-

tery to me. Whereas gadfly stings raise great bumps on human beings, which itch and smart for days; upon cattle, that are at times stung by swarms of these flies so as to be covered with blood-drops, no bumps are seen, nor movements denoting itching or a desire to rub themselves; as soon as the gadflies are gone the stung animal is perfectly quiet. Various explanations may be suggested, but the facts are there to speak for themselves.

An extension of the clothing reform to the gloves will confer a very distinct benefit; and the use of the Sanatory Woolen gloves may be recommended to every one who is dissatisfied with the condition of the hands.

PATENTS.

(1880.)

THE first condition imposed by manufacturers in taking up specialties, is protection by patents or registered designs. It is only under such protection that a man of business will feel encouraged to incur the initial loss involved in the make and introduction of new articles, and subsequently to constitute them an exclusive feature of his trade. Without patents, competitors will at once begin to make and sell goods for which an opening has been secured, and the originator will be damaged, if not ruined.

INVENTORS who present their discoveries free, benefit no one, but do harm to everybody concerned. First: the cause sustains damage, for it cannot be properly advanced; secondly, consumers suffer, since

they can never procure the articles on reasonable terms—if due regard be had to quality and workmanship; thirdly, manufacturers lose, because their earnings are diminished by the difficulties attendant upon a new process of manufacture. Hence it is as a matter of public policy, and not in the interest of individual inventors, that civilized States have very wisely enacted patent laws.

It was on the urgent and repeated recommendation of his Excellency Dr. von STEINBEIS, a gentleman who, greatly to the benefit of the community, has for many years occupied the distinguished post of President of the Royal Central Board of Trade and Industry in Würtemberg, that I, too, resorted to this effectual means of protecting my designs; and the sequel showed me that my adviser had counseled well.

THE OPEN BEDROOM WINDOW.

(1879.)

A BOOK might easily be written on the numerous benefits to be derived from the practice of *always* sleeping with the bedroom window open, and the deleterious effects of neglecting the practice; and on the progress which has been made in the treatment of disease since it has been recognized, as a prime necessity of life and health, that the atmosphere immediately surrounding the body should freely mingle with the open air.

It cannot be too often insisted upon that the body will not be hardened or enabled to resist the attacks of disease, unless there be thorough ventilation of the

bedroom. To insure this, in mild and quiet weather, two windows should be open at the top, when more than one person is sleeping in a room. But, however cold or severe the weather, one window should always be open at the top, as it may be with safety, since the air can be prevented from blowing on the sleeper by the interposition of a blind or a curtain. To endeavor to ventilate a bedroom by an open window in an adjoining room, is useless, as may readily be ascertained by the sense of smell, which is the best test as to whether a room is properly ventilated or not.

If, on returning to a bedroom, in the morning, from the fresh air, it is found to be in the least fusty, it is certain that the ventilation is insufficient. Nor is this fustiness merely a sign that the air is impure; the odorous matters the presence of which the fustiness indicates, are the "noxious" elements of the body's exhalations, and they have an injurious effect when they are inhaled with the atmosphere which they pervade. Various unfounded objections have been urged, tending to countenance a notion that the night air is laden with qualities injurious to sleepers. For instance, it is stated that the night air is vitiated with carbonic acid, which is dangerous to the breathing passages when inhaled. In making this assertion the fact is overlooked that the breathing passages invariably contain air charged with 4 per cent. of carbonic acid, while the proportion in the night air is at most but four parts in a *thousand*. I myself have made the experiment of charging the atmosphere with carbonic acid up to 1 per cent., (two-and-a-half times as much,) without in the least affecting my breathing. On the other hand, if the water that streams down inside

the window of a closed sleeping-room be collected, one drop of this liquid, impregnated as it is with the "noxious" exhalations given off by the sleepers, will suffice to poison a rabbit, as has been shown by actual experiment. Those who have adopted the Sanitary Woolen System, are free from night sweats, and are not subject to the chills of which persons clad in linen, and sleeping in sheets, are so greatly in dread. The woolen clothing and bedding afford ample protection; and if the head, from baldness, or the thinness of the hair, be especially sensitive, some extra light woolen covering may be provided for it. The difference in the effect on the spirits, and in the refreshed, instead of jaded, feeling, on rising from bed, when, by means of the Sanatory Woolen Clothing and Bedding, and the open window, the "noxious" exhalations of the body are allowed to pass freely away, instead of being inhaled over and over again, can only be appreciated by those who have tried it. Children no longer toss about in their beds and throw off the clothes, leaving the lower limbs exposed, while the face and hair are clammy with perspiration. In the hottest nights they lie comfortably, just as they went off to sleep.

WOOLEN CLOTHING FIRE-PROOF.

(1881.)

THE great difference in this respect between woolen and vegetable fibre is worth noticing. Cases often occur in which the hair takes fire, but it never burns down to the skin, as would certainly

happen with vegetable fibre. If a piece of linen or cotton be held over a lighted candle, it ignites instantly, and burns rapidly away, with a white, clear flame, leaving nothing but a light-gray ash. If a similar experiment be made with woolen material, a considerable time will pass before it will ignite at all, and then the flame is extinguished as soon as the material is removed from the lighted candle. Thus, people are fire-proof in wool; *i.e.*, their clothing or bedding cannot take fire; while, when clothed in woven material of vegetable fibre, they are practically torches ready for the lighting.

[Dr. Jaeger here disposes, in a few lines, of one of the most important facts connected with his whole system. There are but few persons who have not had painful opportunity to observe the almost gun-cotton velocity with which cotton clothing flashes into flame, to the utter destruction of one or more victims, and often to the injury of several others. A stray match on the floor or sidewalk; a burning fragment of a cigarette or cigar; too close approach to an over-heated stove or fireplace, is the simple cause of many a horrible death to persons, women and children, clothed in cotton or linen fabrics. No such calamity could befall a person clothed in woolen. Long before the fabric could be heated to the point of ignition, the smell of *scorching woolen* would give ample warning of the impending danger. For night-dresses, nothing else should ever be worn, especially

by children. The non-combustibility of the woolen fibre, in the protection it affords against one of the most common as well as dreadful accidents, is the only property needed to complete the proof of supreme wisdom in its construction, and adaptation to the purpose of clothing the human body.]

THE SANATORY WOOLEN
HANDKERCHIEF, AND CATARRHAL
INFECTION.

(1881.)

LAST winter, when the severe cold weather suddenly set in, and windows and doors in the living rooms were kept closely shut; the diminished ventilation and heated atmosphere caused all things of vegetable fibre in the rooms to exhale the "noxious" odors which they previously absorbed; and whoever, like myself, was compelled by his occupation to remain continually indoors, contracted what is frequently mistaken for a cold, but in reality resembles the disease called "strangles," with which horses, kept in stables, are affected; in other words, we did not catch cold, but we were "poisoned" by the atmosphere of the rooms in which we lived.

(I may here remark that I have been reproached for repeatedly comparing the condition of human beings to that of animals. I am compelled to this by the necessity of keeping before my readers' notice the fact that the Sanitary Woolen System does not promise absolutely perfect health, or perpetual exist-

ence, but only that degree of stability of health which is possessed by the domestic animals.)

I was guided to the above conclusion by the following circumstances, which existed in my own case and in all similar ones that came under my observation: I never coughed out of doors, however cold it might be, nor at night, when sleeping with the window open; the irritation in the throat was only felt when in the living rooms. It was evident from the beginning that the cough originated in the stomach; as a fit of coughing would set in about two or three hours after taking a meal, without any apparant cause. This period coincided with that of the change in the nature of the emanations proceeding from the food in the process of digestion.

My sons, who skated a great deal, and went twice a day to school, were entirely exempt from the disorder in question; and the case of my youngest daughter, who went to school in the forenoon only, was milder than that of my grown-up daughters, who sat at home at their needlework. But the chief sufferer was myself; for while my family betake themselves at from 10 to 11 p.m. to the pure air of the bedrooms, I remain until 2 a.m. in a study filled with books, papers, and other objects, which alternately absorb and exhale the noxious matters in the atmosphere.

I find that the remedy for this disorder consists in:

(1) Thorough ventilation of the living-rooms.

(2) The use of a handkerchief that does not propagate infection. It is an old rule that catarrh will more readily be cured if the handkerchief be changed as often as practicable. This must be due to the

presence, in the used handkerchief, of an infectious agent which renews the catarrhal complaint; and herein lies a striking confirmation of my theory respecting the effects of the "noxious" emanations.

I reasoned that this infectious agent must be the well-known characteristic, odorous matter of handkerchiefs used by catarrhal patients; further, that this "noxious" emanation would be absorbed by vegetable, but not by woolen fibre. In order, therefore, to obtain relief from the disorder, after it had annoyed me for four weeks, I resolved to try the woolen handkerchief, which had already been introduced by adherents of my Sanitary Woolen System, although I had hitherto objected to it as impracticable. This objection I withdraw, and I acknowledge my error. In three days I was freed from the nasal catarrh, and by the fourth day the cough had disappeared; only the mucous membrane of the throat was not completely in order. I may add, that, so far as I could learn, no "hardened" wool-wearers, thus attacked, experienced feverish symptoms, or were interrupted in their ordinary vocations. For instance, when the disorder was at its height I was able, on one occasion, to dictate for seven hours at a time; on another, to lecture and discuss continuously from 7 p.m. to 2 a.m. in a thick atmosphere of tobacco-smoke.

Since I have adopted the woolen handkerchief, the nasal secretion has become quite normal; but the catarrhal affection of the throat and larynx remained almost unchanged, until one day when a light dawned upon me. I had for years smoked a pipe consisting of a clay bowl and a simple reed stem; and it occur-

red to me that, just as the handkerchief of vegetable fibre preserves the infection of nasal catarrh, so the pipe stem of vegetable fibre might retain the infection of throat catarrh. Therefore, if my theory were correct, by substituting a horn mouthpiece for the reed stem the continuous self-infection would cease. This surmise was completely justified by the result. A few days after the change from the wooden to the horn mouthpiece, the catarrh disappeared from my throat, and the voice was restored. Various tests have further tended to establish the fact of the noxious quality of the wooden mouthpiece. Inhalation from it distinctly retarded the rapidity of the movements of the nerves, as measured by the stopwatch; (see page 15;) and I have several times made the experiment of smoking through it since, and with the result invariably of an irritating effect on the throat. This effect, however, passed off again at once, an important indication that the infection does not arise from disease germs, but from odorous matter.

THE ADULTERATION OF WOOL WITH COTTON.

(1881.)

THE surest way in which to detect the adulteration of wool with cotton, is by microscopic examination. With a thirty-fold magnifier the least admixture can easily be recognized. The woollen thread appears as a cylindrical body of almost circular shape, with wavy outline; the cotton thread appears flat and ribbon-like, with angular folds, as if crumpled.

A second test, which any one can apply, is to hold the separated warp and wool to a flame. Pure woolen thread exposed to a flame, fuses to an irregular mass before it is consumed, leaving a shapeless ash; and it ceases to burn when removed from the flame; cotton or linen thread burns steadily on after its removal from the flame, and the form of the thread is distinctly preserved in the ash. If a thread be an admixture of wool and cotton, it will burn irregularly.

THE AIR IN ROOMS.

(1881.)

THE injurious effects of air confined in rooms, upon health, is one of the oldest and best known themes of sanitary science. Writers on health abound with advice as to ventilation; to keep as much as possible in fresh air, and so on; and my readers know the importance of sleeping at night with the window open. Therefore, in making the following suggestions with reference to the air in rooms, I am only pursuing and extending the ancient track. I have now (autumn, 1881) had three years' experience with the Sanitary Woolen System, and I can safely say that it has answered all my expectations. It is a powerful remedy; and, when the body is hardened, maintains those who adopt it in as sound health as, for instance, the horse, or the house-dog. More than this cannot be required of any system, by those who dwell under artificial conditions, within four walls. But the improvement implied by the above comparison, will be patent to every one

who knows how much less often the dog is ill than its owner.

To laymen, at the beginning, the Sanitary Woolen System may have seemed as if it would accomplish even more than this, but medical men know that all systems of cure and rules of health, such as the use of special baths, change of air, change of diet, etc., work much more energetically at the commencement than when the body becomes accustomed to the altered conditions. The reason is that the bodily machine at once seeks to restore the equilibrium thus disturbed, and to this end works more rapidly, causing freer and more abundant exhalation of the "noxious" vapors. The consequent improvement in health, at the commencement, should not be allowed to mislead, as the value of a rule of health can be estimated only when the body is accustomed to it.

This stage in the Sanitary Woolen System has now been reached by many, and the conclusion arrived at is, that the System procures that addition of health for which man has hitherto had every reason to envy the domestic animals; but the wool-wearer shares with the domestic animals those diseases which are the *raison d'être* of veterinary surgeons. The question now to be asked is, Can matters be carried any further? Again the animals supply the answer, and most plainly.

I describe the wool-wearer as being as healthy as a horse or a dog, or more precisely, as housed cattle; a higher degree of health is attained by grazing-cattle—for example, by sheep. These are much less subject to disease due to the personal, "noxious" exhalations; for instance, wool-wearers do occasion-

ally catch cold in the same way and for the same reason as housed cattle, while grazing-cattle are absolutely weather-proof; but the latter are not proof against infectious diseases, although the fact that sheep are more so than oxen, was impressed upon the soldiers in the Franco-German war, who had, for that reason, to subsist on mutton. That sheep are infected with very dangerous parasites, does not affect the argument, for all wild animals have parasites.

To what is the higher degree of health of grazing-cattle due? Simply to the cause that makes our soldiers healthier during the month of the manœuvres than they are when penned in barracks. Grazing-cattle constantly bivouac, at least in summer, and are not poisoned by the air of their stable. Yet a degree higher in health than grazing-cattle, are ground-game, (hares, foxes, deer, partridges, pheasants, etc.,) which also bivouac in the winter. These animals are not only weather-proof, but much less subject to epidemics than grazing-cattle. Still, however, such diseases do occur, and it would be interesting to consider the reasons, which will be explained by the following two facts:

1. Animals that live *on* the ground are nearer proof against epidemics than animals that live *under* the ground; for instance, field-mice are subject to violent epidemics, which will destroy nearly all of them in a district; and this occurs when the mice are so numerous that the whole ground smells of their excrement, and is therefore saturated with poison proceeding from the mice themselves.

2. The birds in the air are absolutely infection-proof. I have never heard of nor seen an epidemic

among crows, jackdaws, sparrows, starlings, swallows. The only diseases to which they are subject are caused by lice and worms; and they sometimes suffer from predatory animals, frost, hail, etc. Their "self-poison" is mainly contained in their excrement, and with this they hardly ever come in contact, while they are removed from every kind of miasma of the ground.

Now comes the question, to what degree of health man may hope to attain, having regard to existing circumstances and customs, and without heavy expenditure; in other words, without building castles in the air, or inhabiting balloons, as he would need do to become as healthy as the birds. This condition is, therefore, unattainable; and here, as everywhere, to demand perfection, generally leads to realizing little or nothing. Those who have followed my suggestions as to Sanatory Woolen Clothing and Bedding, and sleeping with open window, have reached a degree of health equal to that of the horse. The next degree, and the only one practicable for discussion, would be health equal to that of sheep. The experiences of this winter (1881-2) give me the firm assurance that this is tolerably easy of attainment; for, it is merely a question of pure air in our houses and workrooms; respecting which I am in a position to say something more radically helpful than anything my predecessors have said on the subject of ventilation.

Before coming to the practical side of the question, I must again institute a comparison between man and domestic animals. If animals be classified according to the facility with which they contract disease, the

lowest place must be assigned to stalled cattle, the horse, and the ox, who live in the same compartments in which they deposit their excrement. Why does the dog possess a higher power of resistance to disease? Because the dog is cleanly indoors, and does not, like stalled cattle, subject itself to the injurious influence of the odor of its excrement; while even chained dogs are not confined in close rooms. The greatest strength of resistance, and the toughest nature of all, has the cat, which carefully buries its excrement, and is not confined to the atmosphere of rooms, or chained to miasmatic ground, as dogs frequently are, but seeks the airy and lofty parts of dwellings. These considerations show that the worst enemy to the health of every being is found in the malodorous portion of its own exhalations. This is most clearly apparent with respect to sewage; and the attention of sanitary authorities has been rightly directed, in the first place, to the removal of this notorious "self-poison." I may, however, point out that the habit of the cat, which buries its excrement *immediately*, is better than that of allowing it to ferment and distill, so as to give out a maximum of odor.

That the atmosphere in rooms which are inhabited, even when no air from drains, etc., forces its way in, soon becomes loaded with "self-poison," has, of course, long been recognized; but, indeed, too little attention has been paid to the fact that these exhalations are not only dispersed in the surrounding air, but are also caught up and retained by the objects in the room, to be again, on occasion, given out. So long as a dwelling-room is abundantly ventilated there is no danger;

and followers of the Sanitary Woolen System are in this respect much better off than those who are mis-clothed; for they can not only sleep with open window, but also, as they are not afraid of draught, and have less need of external warmth, can work with open windows and doors. I may here remark that while the air in a room remains, through ventilation, free from poison, its temperature may, without becoming too cold, sink much lower than when, in the absence of ventilation, it contains poisonous matter. "Self-poison," in fact, chills; but I know wool-wearers who work in winter by open windows, which, for them, is the right thing to do, as they run no risk of being chilled.

The difficulty begins when the cold necessitates the warming of the rooms; proper ventilation then becomes expensive; for the warmth goes out simultaneously with the vitiated air, so that most people resign themselves to the inevitable; keep their windows shut, and live in a fusty atmosphere.

I believe that the danger thus incurred would be greatly lessened if all those objects, which absorb the noxious exhalations, were removed from the room. If such absorbents would *retain* the exhalations, their presence would be a benefit; but warmth and moisture cause them to give these exhalations out again, and they are therefore malodorous and continue so. After a close examination of the subject, I am in a position to affirm the unwholesomeness of dust in rooms. It is only necessary to inhale the odor from under a piece of furniture, from which the dust is not regularly removed, to be convinced of this; or to compare the very different smell of the atmosphere of

a room before and after it has been thoroughly cleaned and dusted out. Further consideration of what constitutes the dust in rooms, shows that this offensive smell is less that of the dust particles *per se*, than of the fetid odors taken up by them.

The following are mainly the constituents of the dust in the rooms: (a) Earth dust: We know that the earth readily absorbs odors, and gives them forth again under the influence of warmth and moisture; hence the dangerous ground miasmas. (b) Coal dust: Coal has so strong an absorbing power, that it has long been used as a deodorizer. It seems to retain odors more tenaciously than earth dust; however, coal dust cannot be considered harmless. (c) Vegetable-fibre dust: This proceeds from the linen and cotton materials of clothes, etc.; and from the droppings of horses, etc., in the streets; also from the wear and tear of floors and wooden objects. It is clear that vegetable-fibre dust must act in a manner similar to vegetable fibre in clothing.

Dust, thus constituted, cannot but be very dangerous adjuncts to a room, since, if allowed to remain, it becomes poisonous; and, when it is disturbed and drawn into the lungs, it has not only an irritating effect, but, becoming moist, gives out its noxious odors within the body. The disagreeable odor, when a dusty floor is wetted, is well known, and a damp atmosphere suffices to let loose the smell. Hence follows the recommendation, not only to remove the dust of rooms as often and as thoroughly as possible, but also to adopt certain methods of doing it. In dealing with the dust in rooms, most ladies, and their servants, make three mistakes.

The first consists in the dust being more driven and scattered about the room than actually removed. If a room, of which the windows are closed, is swept out, and the furniture wiped down, it looks comparatively clean; but it is not so; because a large portion of the dust has deposited itself on the walls, and on projections, such as picture-frames, mirrors, etc.; between the books on the shelves, and behind the heavier furniture standing against the wall. Nor are things much improved by the opening of one or more windows on the same side of the room. What is needed is a thorough draught of wind; and if a room has only windows on one side, a window in the passage, or elsewhere, should be opened to cause such a draught as will really carry the dust out of the room. Windy weather is, of course, best for this purpose, to which I attach so much importance that I would recommend the sweeping-out of rooms to be deferred when, in the absence of wind, it is impracticable to obtain a good draught.

A way in which to secure important help in getting rid of the dust by means of the wind, is to attach a large piece of pasteboard to a wooden handle, and, after the room has been swept, to stir the air, driving the minute dust out of the corners and angles, away from the walls, preventing it from settling anywhere, until the room *smells* as if it were free from dust. No sense can be so relied on for accuracy in this respect, as that of smell: long after no more dust can be seen, the nose will detect it.

A second mistake, is the belief that through moisture (tea-leaves on carpets, or a damp cloth on wooden floors) the dust is prevented from rising, and

is therefore removed. Some, of course, is removed, but only that which is on the floor, and that not entirely. The fine dust, clinging to the walls and ceiling, can only be dealt with by stirring the air as just described. And it is this fine dust which is most dangerous, for it consists of specifically light organic matters, while the heavier mineral dust sinks to the floor. The third mistake is, the habit of overlooking the dust, which is more difficult to get at, behind furniture, pictures, mirrors, and so on. It is only necessary to smell at these places, to be convinced that they must conspire to vitiate the atmosphere. The removal of such dust would be easier if all furniture stood on casters; but if the furniture is not placed quite close against the wall, a stick may be introduced to loosen the dust, etc., so that it may be driven out when the air is stirred.

Another matter pertaining to the atmosphere in rooms, relates to the flooring and the furniture. Proofs of how eagerly and copiously offensive odors are absorbed by wood, (which gives them out again whenever wetted,) are accessible to any one who likes to try the simplest experiments. I have no longer any doubt that wood, of which the surface is not painted or polished, takes up the exhalations of the body in the same manner as do textures of vegetable fibre when used as clothing.

Every one is familiar with the disagreeable smell of a room in which there is rough woodwork, such as register-boxes, deed-chests, book-stands, and the like, in (German) government offices. The general ill-health among those who work in these offices, which is ascribed to the sedentary nature of their

labor, is certainly not attributable to that alone, but partly also to the exceptionally bad atmosphere, mainly caused by the very old, wooden lumber, charged with evil odors.

All woodwork in rooms, including furniture and flooring, (the former not only externally and in front, but also internally and at the back,) should, therefore, be treated with varnish, oil paint, linseed oil, or some similar preparation, which will have the effect of closing the pores of the wood. One of the most important sources of lurking self-poison, will thus be removed.

Many people object to sitting on upholstered furniture; some find it too warm; others complain that it has an "unpleasant feeling" only. Now, all so-called "feelings" proceed from odorous matters, and the materials of vegetable fibre in the stuffing of a well-used piece of upholstery, will be found, on examination, to emit a repulsive smell. Here, therefore, is another source of vitiated atmosphere in living-rooms, which makes itself felt as soon as the windows are closed. Indeed, the seeds of disease may lurk in upholstered furniture. A medical friend has related to me the following incident: He was attacked by a disease, at first inexplicable, but afterwards declaring itself as the form of intermittent fever prevalent in the tropics, and he was for a long time quite unable to discover the cause. On a subsequent professional visit to the house of a clergyman in his district, the matter was explained. The clergyman, previously an African missionary, incidentally mentioned, pointing to an American chair, that he had lain in it, in Africa, for two years, ill with intermit-

tent fever. Shortly before my medical friend's attack, he had had occasion to sit in this chair for a considerable time.

My sister, resident in New York, has told me that one of the best-known American physicians in that city, once remarked to her that no house ought to be inhabited for more than sixty years; but should then be pulled down, because it is infected by all the diseases of those who have ever dwelt there. He was right. Probably every reader has at some time or other, on entering an old house, full of woodwork, been impressed with the unwholesome smell. What is then to be done? My readers will scarcely reconcile themselves to the radical remedy suggested by the American physician, nor do I consider it necessary. If all plain wood were to be thoroughly oiled or varnished, I believe that old houses would no longer be haunted by such evil spirits. As regards ordinary, upholstered furniture, it would be a great step in advance, to discontinue its use in the rooms usually inhabited, and, if new upholstery be procured, it should be "Sanatory Woolen." I have had the furniture for my daughter, on her marriage, made in this manner by a firm of upholsterers here, and find that it can be easily so made without adding to its cost, or detracting from its appearance. Ordinary upholstery can also be altered to "Sanatory Woolen." I particularly caution my readers against old, upholstered heir-looms, to which the remarks of the American physician respecting houses, quoted above, are entirely applicable.

In conclusion, I fear I must inflict a deep wound on the housewifely heart. If the nose be applied to

white window-curtains, even after they have been up a very short time, they will be found to smell like "dirty wash," and are therefore just as injurious to the atmosphere in the room. Whoever can afford it, should have woolen curtains, and whoever cannot, has the economical alternative of dispensing with curtains altogether. I have never permitted their use in my study, and I therefore know, from experience, that they are not necessary.

COLD BATHS.

(1881.)

FROM time to time I have encountered persons, who declared that the Sanatory Woolen Clothing did them no good, but made them languid and nervous. At first, I attributed this to the early stage of their experience; but when similar complaints were made, in cases where the System had been adopted for twelve months, it became evident that there must be some other cause. I am indebted, for the discovery of this cause, to the circumstance of my attention having been drawn to the fact that similar symptoms are constantly observed in cases of excessive use of shower, and other cold baths. On inquiry, I ascertained that all those who had made the above-mentioned complaints, regularly took such baths. Before I advocated the Sanitary Woolen System, I had spoken against the too frequent use of so strong a stimulant, and what I then said is especially applicable to persons wearing Sanatory Woolen Clothing. The Sanatory Woolen Clothing attracts the blood to the skin, exerting an abiding and ben-

eficial influence; the reaction of a cold bath does the same thing, and exerts a similar influence for a short time. The action of each, taken separately, is good; but, combined in excess, the effect is bad, just as two good meals, taken together, would be unwholesome. For wearers of ordinary clothing, cold baths are beneficial, when not used in excess or too frequently, because the linen or cotton shirt has the bad effect of driving the blood away from the skin. To such persons, the cold bath induces an increased circulation of blood at the surface, at least for a time. But *dry* woolen clothing, after a cold bath, causes such a flow of blood to the surface that the supply to the brain and the intestines is deficient. We here again see that nature's laws must be respected. The wearer of Sanatory Woolen Clothing must take pattern from the woolen-coated animal, which does not throw off its clothing, go into cold water, dry itself, and then resume its dry clothing, but goes, coat and all, into the water. The cooling effect of the evaporation set up through the drying of the wet coat on the body counteracts the excessive tendency to expansion of the surface blood-vessels; and it is precisely to this evaporation that is due the lasting, refreshing effect of the bath. Let the wearer of Sanatory Woolen Clothing follow this example, that is, if he wants to be refreshed, let him wet his fleece. The body should not be dried; and in warm, dry weather the shirt should be dipped in the water, or sponged over, and then the dry overclothing put on. The effect is very pleasant, affording an enjoyment from which the wearer of linen or cotton is debarred, and preventing the languid feeling often experienced, under other

conditions, after bathing. But here again moderation is a golden rule. As already explained, wool-wearers do not require the cold bath for its stimulating effect; while, as the secretions pass freely away in vapor, instead of being turned to water on the skin, the latter remains clean and wholesome. Wool-wearers should, therefore, study their feelings in the matter, and be guided by them. Summer bathing in the open air, should be conducted on the same plan. The shirt should be kept on, or wetted before it is resumed; the best bathing costume is a combination-garment of short-sleeved shirt and short drawers, fitting closely, and made for the purpose. The bather simply keeps this on, and, after pressing out the dripping water, draws on his outer clothing.

The wetting of the underclothing will be found a capital substitute for the refreshment of a bath when the bath cannot be had.

To dispel all misgivings on this point, I may remark that experience has long since shown that pure woolen clothing, when wet, may, without any injury to the body, be allowed to dry on it. A constant proof of this is afforded by the woolen-clothed fisher population on the shores of the Baltic, who are noted for their splendid health.

THE SOCK OR STOCKING.

(1881.)

I HAVE often been requested to offer suggestions respecting the sock or stocking, and I believe that I am now in a position to give full technical directions respecting it.

I formerly attributed the troubles to which the feet of civilized mankind are subject, to the faulty construction of the shoe. I therefore devised the Sanatory Woolen shoe, and only required of the wearer that the sock or stocking should be woolen. The low partition which I introduced into my shoe to separate the great toe from that next to it, and to keep the former in its proper position, whereby its powerful and heretofore disused muscle was brought into play in walking, first caused me to examine the subject of the stocking more closely. I remarked that the separation of the flesh of the great toe from that of its neighbor had a very beneficial result. It is difficult to preserve perfect cleanliness of the feet between the toes, where the two surfaces are pressed together, inducing an offensive condition of the skin quite different from that of any other part of the foot.

The freer exhalation secured by the Sanatory shoe, had improved the condition of my feet, but the skin between the toes could not be said to be restored to a healthy state. Between the great toe and its neighbor, however, which were separated by the little partition referred to above, and by the fold in the stocking, which this caused, the cleanliness was perfect. I concluded that this must be due to the fact that the inside surfaces of the toes were no longer in contact; and I remembered that persons, who suffer much with their feet, find great relief from wrapping a rag round each toe. I was thus led to design a sock like a glove, with a separate receptacle for each toe.

I have now worn this sock for about three months, and I can say that it completely answers its purpose.

The skin between all my toes, has become as clean and normal as that between the fingers of the hand; all offensive matter has disappeared, and the toes are much more supple. The improvement is not confined to the toes, but extends to the entire sole, particularly to the fore part, where formerly, if I walked much, I always suffered. During my last foot-tour, I did not suffer at all, an exemption which I attribute to the ventilation channels formed by the double layer of wool between the toes.

I can therefore strongly recommend this form of sock or stocking to every one affected with disorders of the feet. In cases where two or three toes have grown together, a special construction of sock is, of course, necessary. There need be no fear that these divided-toe socks will necessitate the wearing of unduly broad shoes, if the former be not made too thick. Some persons make the objection that it requires more time to draw the stockings on. They do at first, but practice soon puts that right, and even if an extra minute be consumed, it is not too much to pay for the pleasure of having the skin between the toes as pure and healthy as that between the fingers.

THE SANATORY WOOLEN BED.

(1882.)

THE Sanitary Woolen System requires that the materials of the bedding and clothing, shall consist of animal fibres only. For the stuffing of pillows, feathers are good and sanatory,—though somewhat too soft, and too apt to work through the

felt covering. For the stuffing of mattresses, only two materials are permissible—horsehair and wool.

The horse-hair of commerce is assumed to be animal fibre; but upon this point considerable deception is practiced by unprincipled dealers. They pay, perhaps, 3s. per lb. for horse-hair, and probably not less for ox-hair and cow-hair, which are about equally serviceable. When, therefore, so-called horse-hair mattresses, weighing 25 lbs., are sold at from 75s. to 90s., is it likely that the contents are pure animal hair? Where would be the profits of the dealer and the manufacturer? There are various vegetable substitutes, which so resemble horse-hair, that they can be distinguished from it by the closest examination only. For one example, take the so-called shadow-grass. In fact, unadulterated horse-hair is, nowadays, even more rare than unadulterated wine. This fact taken together with the much higher price of horse-hair, led to the selection of wool as the material for stuffing the Sanatory mattress.

Here, however, other obstacles are encountered. Only carbonized wool; *i.e.*, wool from which all admixture of vegetable fibre has been chemically separated,—can be relied on as pure. Even among the raw materials are scattered bits of straw, and hay, and burrs. But mattresses stuffed with carbonized or raw wool, would not be sufficiently elastic, and would become, after a short use, as hard as boards.

The present manufacturer of the Sanatory Woolen bedding, had, however, been accustomed to prepare wool-stuffed mattresses, (although inclosed in a linen ticking,) as completely and lastingly elastic as the best horse-hair mattresses. This stuffing was made

up of tailors' clippings, (therefore, of unworn clean material,) coarsely shredded. By forming this material into balls, placing them close together and surrounding them with carbonized wool, an excellent elastic stuffing is produced. Before I entered into relations with this manufacturer, tailors' clippings of mixed materials, as well as those of all-wool, were used indiscriminately as stuffing for mattresses. At that time I had a clear perception of the sanatory effects of wool, but I was not so well informed with respect to the unsanatory nature of linen. I knew of the merits of wool, but had not fathomed the pernicious qualities of vegetable fibre. I considered it sufficient, if (1) the coverings, (2) the mattress-ticking, (3) the upper layer of mattress-stuffing, were of pure wool; and I saw no objection to mingling vegetable fibre with the innermost stuffing of the mattress.

As soon, however, as I was led to recognize the injurious effects of vegetable fibre, even when not actually in contact with the body, I insisted that such of the tailors' clippings as were not of pure wool, should be carefully sorted out. To this the manufacturer agreed, premising, however, that it was impossible absolutely to insure that no clipping adulterated with cotton, or with tailors' thread sewed in it, would escape the attention of the sorters. These clippings cannot be carbonized; as the process is only practicable with half-woolen material, in which one thread is all wool and the other all cotton; the destruction of the latter, by carbonization, leaving only the separate woolen threads, which easily dry. But when cotton is mixed with each thread of the material, carbonization does not cause the web to

fall to pieces, and the consequent difficulty of drying the material, makes the process too costly and troublesome. It is obviously of more importance that the stuffing of the pillows should be absolutely pure, than that that of the mattress should be so; and it is to be hoped that so much, at least, can be secured.

THE PLATINUM LAMP DEODORIZER.

(1882.)

I HAVE long felt that the difficulty of properly ventilating the rooms of our dwelling houses in winter, presents the principal obstacle to the practical carrying-out of my system, which, in addition to its title of "Sanitary Woolen," may be termed a "Pure Air," or "Anti-offensive Odors System." I was, therefore, anxious on account of the approaching winter, as, hitherto, during that season, the confinement indoors had invariably led to my being troubled with a cough, but every year in a lesser degree since I adopted the Sanitary Woolen System. This winter the cough made no sign until Christmas Eve, when I read aloud from a new book, to my family, uninterreptedly, for nearly three hours. Towards the end of the reading, I became hoarse, and the next morning the old trouble in the throat had reappeared. There was nothing very remarkable in my having become hoarse after reading aloud for three hours, but for my experience of a fortnight previous, when I had lectured on two consecutive days, at Mülhausen and Basel, respecting the Sanitary Woolen System. On the first day, the conversation, lecture, and discus-

sion, lasted almost without interruption from 2 P.M. to 3 A.M., or thirteen hours; on the second day from 11 A.M. to 1 A.M., or fourteen hours; yet I was in no way rendered hoarse by these exertions. It was therefore clear that there must be some other cause for the hoarseness on Christmas Eve, than the mere mechanical exertion of the organs of speech. When I referred to the circumstance the next day, my daughter, who attends a weekly meeting for the purpose of reading aloud, remarked that hoarseness sets in much sooner when reading aloud than in ordinary speaking, and she attributed this to the smell of the paper. This observation served to explain to me the sudden affection of my throat, and to afford another confirmation of the injurious influence of vegetable fibres upon health. I was thus led to consider in what manner I could improve the unwholesome atmosphere engendered by the mass of papers and books with which my study was and is crowded; and my glance fell on a small object which had stood in my room unused for nearly two years—the spirit lamp, with platinum spiral, constructed by the well-known DÖBEREINER.

The lamp was recommended to me some time ago, as a contrivance for continuing the diffusion of perfumes into the air of rooms; and I intended when I purchased it that it should diffuse odors by which I might illustrate some points in my lectures; but I never happened to make the experiment. I now, however, determined to use the lamp in order to diffuse ozogen throughout the room, that admirable agent for destroying odors; and the result quite exceeded my expectations.

The instrument in question is an ordinary glass, spirit lamp, with a spiral-shaped thread of platinum encircling the upper end of the wick. When the lamp is lighted, it burns with a flame, but as soon as the platinum spiral glows and the metal holder of the wick is sufficiently warm, the flame will either expire, or, if this be delayed too long, may be extinguished by quickly popping the glass cover on and off again, when the platinum spiral will remain in a glow until all the spirit in the lamp has evaporated; for platinum has this remarkable peculiarity of continuing to glow in warm spirit-vapor.

The practical effect of this is, that, as the air immediately surrounding the spiral becomes heated, it rises, and is replaced by air drawn in from all sides under the glowing spiral, through which it is compelled to pass, causing all combustible matter contained in the passing air to be consumed. If half a dozen smokers were to endeavor to fill an ordinary-sized room, in which such a lamp is burning, with tobacco smoke, they would not succeed. The fumes would be continuously drawn through the lamp and consumed. The same thing happens to all odorous matters in the air of the room. If the platinum lamp be lighted in a room after dinner, however strongly the atmosphere may be charged with odors, in a few minutes all trace of them will vanish.

This effect of the lamp in purifying the air, was already known to others, and was, therefore, not discovered by me. What I did discover is, that if a small quantity of ozogen be mixed with the spirit, it is not at once consumed, but continuously mingles with the atmosphere in very fine proportions. Its action

is then twofold: it destroys all offensive smells in the atmosphere; and it is inhaled into the body, where it develops this deodorizing faculty in an extraordinary degree.

Drawing on my own experience for a guide for others, I may state that I was formerly greatly troubled with indigestion. Under the Sanitary Woolen System, the daily recurrence of flatulence and heartburn had nearly ceased; but they were, occasionally, still felt, especially in winter, although in a much milder form. My suffering from wind in the intestines had not, however, undergone so radical a change; I was much less troubled, but still it made itself felt daily. In the last seven weeks, during which I have allowed the platinum lamp to burn in my study and sitting-room throughout each day, a very great alteration has taken place. Of flatulence and heartburn there has not been the least trace, while the trouble from wind has been reduced to a minimum.

The deodorizing influence of the platinum lamp, has extended to the evacuations, which are much less offensive; and they have been delayed for several hours without any detrimental effect. This last circumstance is strong evidence of the correctness of my doctrine of the ordinary sensations—that they are all, without exception, produced by odorous matters. This special sensation is locally felt, just as is the opposite sensation of hunger, but is actually due to a certain concentration in the body, of the odorous emanations from the digested food. The subsequent relief is not merely mechanical, but it is caused by the removal of these “noxious” emana-

tions, with their depressing and enervating influence on the whole system. The concentration is retarded by the deodorizing effect of the ozogen diffused by the platinum lamp. It is a common experience that in traveling, and generally with change of air, the sensation above referred to is absent, even for days ; the reason being that the impulse given by the change of air, to the exhalation of the skin, prevents the necessary concentration of the odorous matter.

If we consider the great influence, upon health, of the gases which accumulate in the intestines, and which must be abnormal, inasmuch as healthy wild animals are free from them, the experience described above is highly significant.

The lamp, however, is open to one objection, which should not be too lightly estimated. When I began to burn it, I was warned that minute quantities of platinum would evaporate, and induce headache. This result made itself felt after the lamp had been burning for several weeks, and its use had to be discontinued for some days, until the headache ceased. This fixes a limit to the use of the lamp. Some persons will not be able to endure it very long ; while those who are less sensitive should employ it only when ordinary means of ventilation are not at hand, and even then not for too long, extinguishing the lamp as soon as their head is unpleasantly affected.

While I was quite unprepared to find that the platinum lamp would accomplish all that I have described, I was also struck with what it failed to accomplish. I had hoped that its effect on the air of the rooms would be the removal of the disturbance in my throat, but such was not the case. The complaint,

however, assumed so mild a form that I was able, on the occasion of a lecture which I gave at Basel, to speak for twenty-eight out of the sixty hours of my entire absence from home; twenty-four hours being spent on the railway, and five in sleep; yet my throat was rather better than worse afterwards; but it became hoarser a week later, when I lectured and spoke for a period of seven hours. It improved, however, when the barometer fell, and there was more stir in the outside atmosphere, to the stagnation of which the affection in the throat was due, and not to the air in the rooms, which had been purified and deodorized by the platinum lamp and ozogen.

I recommend the use of the lamp in badly ventilated rooms, such as workrooms, offices, schoolrooms, and in cases in which the ventilation is inevitably insufficient. Persons who believe that they cannot sleep with their window open, whether on account of cold, or of chronic illness, or because of the vicinity of some ill-smelling locality, should deodorize the air of their rooms with this lamp, bearing in mind that, when it is allowed to burn too long in a room of moderate dimensions, it may induce headache. Lastly, all sufferers from the disorders which I have indicated as arising during the period of digestion, will find great relief by using this lamp.

DIRECTIONS FOR USE OF THE PLATINUM LAMP.

The spirits of wine must have a strength of 96° "Tralles," or the platinum spiral will not glow, and be perfectly free from fusel-oil, which, otherwise, would be diffused in the air of the room. Disappoint-

ment frequently results from the use of a too-low grade of alcohol.

Before lighting the wick for the first time, both wick and spiral should be well sprinkled with spirit, and the circular rim of the metal wick-holder should be filled. The flame should burn three or four minutes, (or half that time for a wick already in use,) in order to draw up sufficient spirit into the wick to keep the platinum glowing. When the flame has burned sufficiently long, the glass cover should be popped quickly on and off again, extinguishing the flame, when the platinum spiral will continue to glow until the spirits in the lamp are consumed.

Great care should be taken to prevent the wick from touching the spiral at any point. The turns of the spiral must not be too close, or ashes and dirt (taken from the air) will accumulate, and obstruct the passage of the air. When the platinum is glowing, the distances between the spirals may easily be adjusted, if necessary, with the help of a needle.

By pushing the wick up or down, more or fewer of the turns in the spiral can be made to glow, but three or four are sufficient.

The lamp should be screened from draught ; but, if a light current of air causes the flame to revive, the turns are too far apart, and should be gently compressed downwards.

To extinguish the glow, the glass cover is placed over it, and should be left until the lamp is again required, as, otherwise, the spirit will evaporate.

If the spiral is kept glowing until all the spirit is consumed, the wick will char. If this happens, the charred portion must be removed, and the wick tied

round with thin thread, and trimmed with scissors, so that it may be isolated from the platinum.

A few drops of eau de Cologne or other perfume, added to the spirit, will be continuously imparted to the atmosphere. The important, deodorizing effect of mixing ozogen with the spirit has already been explained. The usual proportion of ozogen to one filling of the lamp, is 15 to 20 drops; but this may be varied according to the size of the room and the number of persons in it. For very large rooms, and theaters, two or more lamps are necessary.

If the spiral be so dirty as to interfere with its glowing, it may be removed, carefully rolled into a coil, and polished bright; it should then be re-twisted on the glass tube furnished for the purpose into a spiral shape, and applied once or twice round the bottom end of the wick-holder, to which it will then cling.

WRITERS' CRAMP.

(1882.)

A FRIEND, who is over 60 years of age, and who has not yet adopted the Sanitary Woolen System in its entirety, writes to me: "Your account of the effect on your throat, of the smell of the paper from which you were reading aloud, set me thinking, as I write daily for several hours, and have always much occupied myself with paper. You may perhaps remember that I have complained to you respecting cold in the hands, especially in the fingers. Particularly when writing, even in a warm room, the cold

seemed to penetrate to the bone. My attention having been aroused by your remarks respecting paper, I laid a piece of woollen cloth on my writing paper, so that the latter no longer came into direct contact with the fingers. I immediately experienced a remarkable improvement, and now, after trying this device for several weeks, I am completely freed from the inconvenience referred to."

This communication led me to suggest that the exceedingly troublesome complaint of writers' cramp, by which many have been deprived of the means of earning their living, and with which medical science has hitherto found it so difficult to deal, is due to the influence of the vegetable fibre of paper, and may be cured by the use of a strip of woollen material under the hand. The correctness of this conjecture has been strikingly confirmed by the well-known scholar and author, FR. V. HELLWALD, who informs me that he has acted on my suggestion, and has since been entirely free from writers' cramp. Others have written me to a similar effect.

THE SANITARY EFFECTS OF COLORS OR DYES.—I.

(1882.)

THE difficulties which surround the investigation of this subject, whether from a scientific or a practical point of view, are considerable. In the first place, many different chemical substances and combinations of substances have to be taken into account; secondly, the matter is embarrassed by the

difficulty of ascertaining with what dye a material has been treated; for, in the division of labor involved in the production, the material may have passed through several hands after it has left the dyer, who, moreover, often regards his method of procedure as a business secret. Notwithstanding these obstacles, I have arrived at a point where I can lay down certain principles, accompanied by the needful explanation; and I can do this the more easily because there is a remarkable analogy between these principles and those on which the Sanitary Woolen System is based. Although, in the essay on "The Nature of Disease," I have already stated the following fundamental truths, they cannot be too deeply inculcated, and I therefore recapitulate them.

If a strongly concentrated odor be inhaled, or a strongly concentrated fluid be swallowed, the smell or taste is repulsive; the rapidity of the voluntary movements, as measured by the stop-watch, (see page 7,) is retarded; the limbs feel heavy, as if fatigued; the breathing is more difficult, particularly when an odor is inhaled; the flesh becomes soft; the body is distended; the heart beats more quickly and less regularly; the mood is depressed. In other words, matters so concentrated induce feelings of weariness, weakness, languor, and depression; and if the degree of concentration be intensified to a certain point, death will result.

Rarefied or diluted matters have a pleasant smell or taste, and are appropriately termed "fine." The rapidity of the voluntary movements when measured, as before stated, is enhanced; there is a sense of lightness and vigor in the limbs; the breathing is easy;

the heart beats strongly but slowly; the mood is cheerful; in short, those rarefied or diluted matters have a cheering, freshening, invigorating, and wholesome effect. They are, therefore, conducive to health and life, while concentrated matters are poisonous and cause illness.

On these fundamental facts, are based the following principles respecting the sanitary importance of colors: It is well known that dark colors are less healthy than light ones. Coloring matter in a concentrated condition is dark, and, in a rarefied condition, light. When evaporation from coloring matter is inhaled, the odor from the dark color is concentrated, and from the light color is rarefied. The distinction is especially noticeable in summer, because, in the sun, dark colors absorb more heat, and therefore evaporate more freely than light colors. This explains why darkly dyed clothing is particularly disagreeable in summer, rendering the atmosphere hot, oppressive, and exhausting.

It is clear from the foregoing that the greater or less readiness with which a coloring matter evaporates, constitutes an important difference. From this, two deductions may be made.

1. Natural colors are preferable to artificial. Whenever natural coloring matter is present in hair or wool it is not situated on the surface; either the inner pith of the hair is colored, or, when the outer stratum of the hair, which consists of numerous very minute spindle-shaped cells, is colored, the coloring matter is found in the centre of each cell, while the rind of the cell is colorless. This may be verified by examining, through the microscope, black horse-hair resolved

by sulphuric acid into separate cells. With dyed hair, the coloring matter is, at best, but equally distributed in the hair, and will clearly evaporate more easily than natural coloring matter, as it lies partly on the surface, while the latter is completely inclosed.

2. "Fast" dyes; *i.e.*, those which do not fade—are more wholesome than dyes which fade readily. The fading is generally, although not always, caused by evaporation. A dye which fades rapidly, therefore, gives off a concentrated vapor, and is thus injurious. A dye which fades or evaporates little, or slowly, gives off a rarefied vapor, and is therefore wholesome. Whether a color will fade quickly or slowly will depend partly upon the volatility of the coloring matter, and partly upon the degree to which it penetrates the fibre. The foregoing explains the important difference between indigo-black and other black dyes; the former, as a much "faster" dye, is considerably less injurious than the rapidly-fading logwood dyes. Among the lighter coloring matters, cochineal is well-known to be the "fastest," and accordingly the most wholesome.

Of the foregoing propositions, the leading one is corroborated by the following fact. Coloring matters, not only affect the health directly through their own nature, but also by their relation to the exhalations of the body. Such coloring matters as attract the "noxious" exhalations, are inferior to those which attract the "salutary" exhalations.

The precise quantity of odorous matter which a solid body (in this case a coloring matter) will attract, depends, when other conditions are equal, on

its own bulk; in other words, on the degree of its concentration: a concentrated; *i.e.*, dark—coloring matter attracts more odorous matter (because it represents a greater bulk) than the same coloring matter will when rarefied; *i.e.*, when of a lighter shade. Another well-established fact is, that all matter, when concentrated to a certain degree, becomes injurious; some reaching this degree sooner, and some later. The difference between the “salutary,” and the “noxious” matters of the exhalations of the body, is merely in the degree of concentration at which they become injurious. Hence it follows that whether a coloring matter attracts by preference, the “salutary” or the “noxious” matters, it will be wholesome in inverse proportion to the quantity of odor which it takes up; and this again depends upon its own degree of concentration—that is to say, upon whether it is employed to produce a light or a dark dye. Thus, light colors are, directly and indirectly, more wholesome than dark colors.

I am certain that those readers who have been in the habit of observing for themselves, and of reflecting on this subject, will be able to supply confirmation of what I have stated. They are doubtless familiar with the fact that black clothes are less comfortable than light-colored clothes, and that they have a more disagreeable odor.

The effect of various colored clothing on the nerves, was strikingly confirmed by numerous nerve-measurements, which I made on several days in succession between 8 and 9 a.m. I wore the same underclothing in each case.

In a brown suit the average interval of time on

ten occasions, required for the finger to stop the watch, was $\frac{80}{1000}$ parts of a second; in an almost black, indigo-dyed suit the average on eight occasions was $\frac{100}{1000}$; in a logwood-dyed, black suit the average on twenty occasions was $\frac{144}{1000}$. Thus the indigo suit was 25 per cent. and the logwood suit 80 per cent. worse than the brown; indigo being, however, 55 per cent. better than logwood. Further observations which I made, as to the effect of colors on the powers of physical endurance, confirmed the foregoing.

THE SANITARY EFFECTS OF COLORS OR DYES.—II.

(1882.)

TO the proper understanding of this subject, it is necessary to bear constantly in mind that each person has an individual constitution, and that, consequently, all people are not affected alike by one and the same substance or matter.

This may be illustrated by the well-known difference of taste which exists respecting even those foods, which would be expected to please and suit everybody; as milk, for instance. Many thoroughly healthy people cannot endure milk; in nearly every large household will be found one person at least who not only dislikes milk, but to whom it is a cause of stomach-ache and diarrhœa. Others, again, who are fond of cow's milk, have an insuperable aversion to the milk of goats or asses.

This like or dislike for certain foods, is apt to run to extremes—that is to say; one class of people will

be exceedingly fond of them, while the other will be equally averse to them; I refer to mutton, onions, garlic, cheese, craw-fish, strawberries, etc. The latter two delicacies have to bear the opprobrium of producing, in certain constitutions, eruptions of the skin, inflammation of the throat, and similar disorders. I myself suffer from inflammation of the throat if I eat strawberries; and this idiosyncrasy began with the setting-in of puberty, and therefore with a so-called change in the constitution.

Differences in constitutions are also stumbling-blocks to the physician in the medical treatment of sick persons: a medicine which has done good service in ten cases, may possibly, in the eleventh, not only fail, but do positive harm; and doubtless many persons have been thus unintentionally poisoned by the medicines administered to them. This consideration has brought treatment with medicine, especially in big, so-called allopathic doses, into such discredit, not only with the public, but also with the medical profession itself, that the modern allopath is very reluctant to prescribe medicines. The ill-effects of large doses have given rise to homœopathy, or the system of minute doses, whereby the danger of causing injury through a wrong remedy, is greatly diminished. But the diversities of constitution, which again constantly vary, even in one and the same person, according to the disposition, *genius epidemicus*, etc., also constitute the main difficulty in homœopathy, which fails to cure if the remedy applied be "individually" wrong.

Returning to the question of colors: the diversity of taste in the choice of the colors of clothing is suf-

ficient to show that no color affects all persons alike. Certainly, inasmuch as science ignores that of which instinct and feeling really consist, the eye alone is assumed to be responsible for the diversity of taste in the matter of colors. This assumption, however, is shown to be incorrect by the actual discomfort, or, at least, diminution in comfort, which most people feel in black clothing. Other cases may be cited which arise from time to time, especially since the introduction of aniline dyes, of severe and dangerous poisonings caused by the dyes in articles of clothing.

That I am able to throw new light on this subject, is partly due to my discovery, in the "neural-analysis," * of a method of testing the noxious or salutary quality of any given object, by accurately measuring the effect of the inhalation of its odor, in retarding or accelerating the rapidity of the nervous action; and partly to the fact that I have derived information on the subject from experience with the Sanitary Woolen System.

When a white linen shirt is worn between the almost universally dyed outerclothing and the body, the action of the dye on the health cannot be so powerful as when the underclothing is dyed, which is very commonly the case with woolen shirts and vests. Moreover, the Sanitary Woolen System causes the skin to develop much greater activity, and, therefore, more warmth in the wearer of woolen than in the wearer of linen; and it is the warmth of the skin which brings into action the dye of the woolen shirt. I will here mention two cases, which have come

* See page 15.

under my observation, respecting dyes hitherto considered harmless—logwood and cochineal.

A lady writes to me, that, on October 16, she put on a gray “combination” garment before going to bed, and awoke after an interval of one hour with strong feverish symptoms, and with such pains, especially in the region of the stomach, that she thought she must have unwittingly taken poison. This condition lasted until the morning of October 18th, when it occurred to my correspondent that the cause of her trouble might lie in the garment, which she accordingly changed; whereupon the relief was complete and the fever and the pains subsided. I found that the garment, which was forwarded to me for examination, was dyed with logwood; and on applying the “neural-analysis” test, I found that its effect on the nervous action was a retardation of 34 per cent.

My first insight into this subject, obtained from personal observation, was on a recent occasion when I had to wear mourning. Under my black clothes I wore a cochineal-dyed shirt. About this time an Italian physician had remarked to me that the Savoyards wear wool almost exclusively, (as, indeed, the common practice is throughout Italy,) but that they suffer much from ischias—pain in the hips. Not long afterwards, I felt occasional drawing and burning pains in the neighborhood of the hips and loins, and I was reminded of the foregoing remark, which I admit caused me considerable alarm. I found, however, as I went on, that at night I was free from the pain, which I felt more keenly in a sitting posture, when the trousers were drawn tighter, caus-

ing a partial numbness with a sense of uncomfortable heat over the entire region. A rapid walk on a warm spring day, solved the problem over which I had for some time puzzled in vain. The exercise induced perspiration, followed by a sensation, in the region of the hips and loins, like that produced by a mustard plaster. It then first occurred to me that the black trousers might be the cause of the annoyance, which, indeed, rapidly subsided as soon as I changed the trousers for a brown pair. In this case the "neural-analysis" of the cause of offense showed the nervous action to be retarded 75 per cent.

In another instance, a friend reported to me that a numbness or loss of feeling in the skin of the chest had caused him serious alarm, until he found that the feeling was restored on his putting-off of the gray woolen shirt, which, like my black trousers, had been dyed with logwood.

An interesting commentary on the effect of logwood, was supplied to me by a hat manufacturer, to whom I related the foregoing incidents, and who remarked that the effect of logwood in depriving the skin of the sense of feeling was well known in the trade. As a practical illustration he pressed the burning end of his cigar in the hollow of his hand without any sign of pain until the odor of scorching skin was perceptible.

As regards the effect of cochineal on certain constitutions, I may say, that I have heard of several cases in which the wearers of shirts thus dyed, have suffered from rheumatic and other pains, which have disappeared as soon as the shirts were cast aside. Cochineal dye may be compared, from a sanitary

point of view, to craw-fish or strawberries; to some constitutions it is agreeable, while to others it is poisonous. The proverb says, "What is one man's meat is another man's poison."

THE SANITARY EFFECTS OF COLORS OR DYES.—III.

(1883.)

AMONG the researches into the effects of coloring matters on the health, a leading place must be accorded to those instituted by the homœopathic body, whose inquiries, however, have not been directed to the action set up by the dyes in clothing, but to their action when taken internally in the form of medicines. For the instruction of those of my readers who are unacquainted with the homœopathic doctrine, I append the following summary of its principles.

Every substance, when swallowed in sufficient quantity, develops conditions of illness, or, in fact, of poisoning, which are peculiar to each special substance, and consist of a certain combination of symptoms.

Homœopathy teaches, that, if a disease be indicated by a complication of symptoms similar to those which are induced by swallowing a large dose of a medicinal substance, a homœopathic dilution of the latter is the proper remedy. It is necessary to the comprehension of this position, that regard should be paid to what I have previously written on the subject; especially where I have pointed out (on page

153) that the action, on the body, of any substance that is swallowed or inhaled, is of two entirely opposite natures: in a large, or poisonous quantity, it disables, and causes illness; conversely, in small, so-called homœopathic doses, it animates, arouses, and exerts a healing influence.

In treating of the action of dyes in clothing, the foregoing consideration is of the highest importance; if the dye is fixed so fast in the clothing that, even when the body is heated, only minute; *i.e.*, homœopathic—quantities mingle with the atmosphere of the clothes, and thence with the atmosphere which is breathed, their effect is, as a rule, that of the homœopathic dose, and it is then favorable, provided that there be no special individual antipathy (or so-called idiosyncratic aversion) to the substance in question. If, however, the dye adheres loosely, or is “spurious;” *i.e.*, readily fades; or if, when the dye is genuine and “fast,” there is, in consequence of insufficient rinsing after the dyeing process, a surplus of loose coloring matter, (perceptible by its rubbing off,) the poisonous, deleterious effect will be apparent.

A further consideration is, that the evaporation of dye from clothes is largely dependent on the temperature and humidity of the atmosphere; being less under conditions of cold and dryness, and greater under those of warmth and moisture. Thus the effect of a dyed garment in winter, or in dry weather, or when the body is in repose and the skin is cool, may be nul, or even agreeable; while in summer, in hot rooms, or when the body is heated, deleterious effects (discomfort, languor, local pains, etc.) may be felt,

especially when to these conditions are added a damp atmosphere and perspiration.

The principles of my system of coloring matters, are the necessary deductions from the foregoing considerations, and I will here briefly recapitulate them:

1. For summer clothing, working, and every-day costume, especially for any kind of athletic sport, and for wear in hot climates, the material should be entirely free from dye; *i.e.*, natural white or natural brown.

2. Dyed materials are least injurious in winter, in cold climates, when the body is in repose, and for Sunday, visiting, and holiday attire; but are not suitable for dancing exercise, which is a species of athletic sport.

3. All dyes that readily fade are to be rejected. The assertion that aniline dyes are injurious only when they contain arsenic, is entirely erroneous; they are chiefly noxious because of their volatility.

4. "Fast;" *i.e.*, non-volatile—dyes are not objectionable when no residue or surplus of loose, unrinsed dye is left in the garment: any such surplus is readily detected by the "color coming off." As the rinsing can be complete only when the wool is dyed before being worked up, all fabrics that have been dyed in the piece, or printed with dyes, should be rejected.

5. The less coloring matter a garment contains; *i.e.*, the lighter it is dyed—the less will be the danger from the coloring matter.

In carrying out a system of sanitarily colored clothing, it would be impracticable to discard all artificial dyes, and I have therefore adopted some of

them, especially indigo and cochineal. Indigo, cochineal, and logwood are all capable, under certain conditions, of acting as poisons; but practically, indigo and cochineal, as "fast" dyes, never evaporate from the clothing in such quantity as to produce injurious effects in persons of normal constitution. The contrary, however, is true of the "spurious," logwood dye, which has also the faculty of attracting the "noxious" exhalations of the body.

GIRDED LOINS.

(1882.)

A CORRESPONDENT who has adopted the Sanitary Woolen System writes: "I cannot become reconciled to wearing a belt, notwithstanding that this was generally practiced in the Middle Ages, and is still customary with the military, and among the inhabitants of southern countries, although nothing similar obtains among any of the four-footed creation. To wear a belt, seems contrary to nature, as it checks the processes of breathing and digesting; especially the former, in the case of the male sex, whose respiration brings the abdominal region more into play, while the female sex breathe chiefly in the region of the chest. The man's breathing-muscles are attached to the cervical vertebra, the collar-bone and shoulders, and the ribs, which latter they extend and widen. So that, if a belt be worn, only the upper part of the chest is capable of the proper undulatory motion incidental to respiration."

In reply to this, I have to say that my experience

in wearing a belt covers different periods of my life. As seminarist and student—a period during which my health was good—I regularly wore an ordinary gymnastic belt, and found that it agreed with me very well, excepting this fact, that, if I took off the belt when I was perspiring freely, I readily caught cold in the part which the belt had covered. The cold induced pains in the region of the navel, (such as are caused by cramp or colic,) which were very troublesome for two or three days, without, however, affecting the bowels. I consider this disturbance to have been an affection of the peritoneum, caused by enervation of the skin of the abdomen; for, of course, at that time I was not clothed in wool.

In the second period of my life—from the age of 27 years to 46—during which I suffered from indigestion, as I have elsewhere stated, I wore no belt, and could not bear to have anything tight round the loins, because the circumference of the abdomen continually varied; and, after meals, when my dyspepsy became painful, I was obliged to loosen the trousers, although they were made to fit very easy. The pain in the region of the navel, described above, frequently made itself felt, especially in summer.

About the time I introduced the Sanitary Woolen System, I was reading the well-known *gourmand* BRILLAT-SAVARIN, who writes amusingly and even instructively, but whose book has as little claim to the title of *The Physiology of the Sense of Taste* as a cook would have to that of “physiologist.” I was much struck, however, by the remark, that in cases of tendency to corpulence, the wearing of a belt, not only in the daytime but also at night, was to be

strongly recommended. I was aware of the fact that corpulence was injurious, and that the body, when constrained, possessed great capacity of self-help. Simultaneously, therefore, with adopting the Sanitary Woolen System, I began to wear, during the day only, an ordinary leather belt, about two inches wide. I found that I could bear it very well, and as the Sanitary Woolen System caused my dyspepsia, and the puffed-out condition incidental thereto after meals, to subside, I could maintain the belt at the same tension throughout the day without inconvenience. Certain other evils, however, were brought to notice.

I *felt* that a LEATHER BELT was unsuitable, especially when I perspired; and there gradually arose a disagreeable sensation in the skin wherever pressed by the belt. The test of nerve-measurement (see page 15) by inhalation of the odor of the belt after it had been some time in use, explained this sensation, as the result was a diminution of 38 per cent. in the rapidity of the nervous action. I consequently tried a woolen belt of similar width, but it afforded too little resistance, and was soon useless, rolling up, and cutting like a rope. My hope that the body would accommodate itself to the pressure of the belt was not realized as I desired; the circumference under the belt continually lessened, so that I had to keep tightening the strain to prevent the trousers from slipping; but above the belt, and to some extent below it, the protuberance was proportionately increased. It was thus clear that this form of woolen belt did little or nothing to hinder corpulence. In spite, however, of the inconvenience mentioned, I considered that the belt had distinct advantages, as

somehow I felt comfortable with it, and during this period, which lasted till within a year of the time of this writing, I was free from the pain over the navel, previously referred to.

My experiments entered on a new phase in the last excessively hot summer. I must premise that I formerly suffered considerably from difficulty of breathing and from great corpulence—measuring $42\frac{1}{2}$ inches round the body. The relief afforded by the Sanitary Woolen System has exceeded all my hopes and expectations; but still, I am not entirely satisfied. The normal measurement round the body should be 75 per cent. of that round the chest. The latter, in my case, is $39\frac{3}{8}$ inches, and the measurement round the body should therefore be $29\frac{1}{2}$ inches; whereas it fluctuates between $31\frac{1}{2}$ inches and 34 inches, according to my condition and the season of the year. It is thus still about 4 inches too great, and I know that in proportion as it is less or greater, I am more or less healthy.

The difficulty in breathing, had also greatly diminished, but I was unable to account for the circumstance that, when I walked somewhat quickly up hill, I felt—especially in hot weather—a pain at the lower end of the breast-bone, shooting right and left. I was often puzzled as to the origin of this pain, and had long accepted a mistaken theory, that it arose from some old-standing distortion of the lungs and chest, which would accompany me through life, when light was at last thrown upon it in the following manner:

I was panting up the southern slope of a valley at the hottest period (between 4 and 5 P.M.) of one of the

hottest days of last summer, the path being entirely without shade, and the sun burning pitilessly down upon me, when I suddenly perceived that the pain arose exactly at the junction of the diaphragm with the anterior verge of the chest, and was the natural consequence of the vehement action of the diaphragm. On further observation of my movements in breathing, I remarked that I breathed exclusively in the region of the diaphragm and lower ribs, and that the upper ribs remained almost entirely inactive. I then remembered the well-known fact that difficulty in breathing (asthma—in horses, broken-windedness) is caused by a wasting of the lungs, which always commences in the tissues of the upper portions of the lungs; and I had long felt that this affection was due to insufficient use of the lungs. When I further considered that men are much more subject to asthma than women, I had a clear perception of the whole case, which may be stated as follows:

Two modes of breathing must be distinguished: (1) Quiet breathing, when we are lying down, sitting, or walking slowly, is differently performed by men and by women; at least, this is the case in our state of civilization, although I doubt whether it is so everywhere. Men breathe only in the region of the diaphragm, whereby merely the lower portions of the lungs alternately are filled and emptied, while the upper portions are inactive. Women, on the other hand—chiefly because the diaphragm is hampered by the corset, or by the clothing tied round the hips—breathe in the region of the upper ribs, and, therefore, with the tips of the lungs; and this is the reason why women are attacked by asthma rela-

tively less frequently than men. (2) When the breathing is accelerated by strenuous exertion, the difference in this respect between ordinary men and women disappears, and the whole of the lungs is called into play.

It is thus clear, that when a man leads a sedentary life, and is seldom or never compelled by strenuous bodily movement to breathe violently, two things will happen: The inactive tips of the lungs will waste away, begetting a subsequent difficulty in breathing; and he will become so accustomed to breathing solely in the region of the diaphragm as to lose all facility of breathing in the region of the upper ribs. If an occasion then occurs for more abundant respiration, the body will fall, from habit, into the error of endeavoring to meet this extra demand by increased activity of the diaphragm, instead of obtaining assistance from the region of the upper ribs. The twofold consequences are: (1) Inadequate respiration, because only the lower lobes, instead of the entire lungs, are worked; (2) the pain which I have mentioned above, produced by the vehement movement of the diaphragm.

In considering how this might be remedied, the circumstance that the climbing of ascents induces enhanced activity of breathing, led me to think of people who inhabit mountainous districts; and before my mind's eye stood the German Tyrolese, (whom I have long respected for their simple and healthy manner of living,) with their belt of nearly two hands' width in front. I reasoned that the wearing of so broad a belt limits the range of breathing in the region of the diaphragm, and so, whenever the

need for breath increases, compels recourse to the region of the upper ribs, thus preventing (1) the wasting away of the tips of the lungs through disuse; (2) the habituation of the body to dispense with breathing in the region of the upper ribs; (3) excessive and painful breathing in the region of the diaphragm.

I at once caused a belt, as broad as that of the Tyrolese, to be made of strong woolen material; and the result surpassed my expectations. The effort of breathing, when climbing ascents, was greatly lessened, and I was at once entirely freed from the pain in the diaphragm.

What, of course, could not at once be remedied, was the wasting-away, which had, undoubtedly, affected the tips of my lungs. How far this loss, in the case of a man in his fifty-first year, can be recovered I am unable to judge; and I do not suppose that, especially with my sedentary mode of life, I shall ever become an active mountaineer. But the fact remains that I have occasion weekly to make an ascent of 705 feet, in a distance of $1\frac{1}{4}$ miles. I do this without effort in twenty-five minutes; and, if I exert myself, in twenty minutes. When I also consider that I can trot $1\frac{1}{2}$ miles on a slight descent, I feel, that, as an asthmatic subject of many years' standing, I have reason to be satisfied; and I ascribe these results chiefly to the Sanitary Woolen System, and partly to the Tyrolese belt.

The belt must be 6 inches broad in front, narrowing on each side towards the hips. The chief difficulty of constructing such a belt of woolen material, was the tendency of the broad band to fold together,

and thus defeat its purpose. This has been overcome by inserting pieces of whalebone or steel; and I can now strongly recommend the wearing of this broad belt, especially by those who suffer from corpulence and difficulty of breathing.

THE CORSET.

(1882.)

THE substance of Dr. Jaeger's chapter on the corset, is that, until recently, at least, the leading authorities had but little to say upon the subject of clothing for women, beyond a sweeping condemnation of the corset, giving cases and illustrations of its pernicious effects. The Doctor takes the ground, that, except for the exceedingly tight lacing, so much in vogue, the material of the corset has more to do with the mischief wrought than the form or fact of the corset itself. The tight lacing is generally induced by a "feeling of want of support," resulting from the enervating influence of unsanatory clothing; and by a desire to prevent an "unshapely increase of bulk." The force applied for these purposes, frequently causes derangement and disease of the internal organs.—EDITOR.

THE SANATORY BOOT.

(1882.)

A SANITARY construction of boot requires that, as far as possible, all impediment to evaporation should be removed, and that perspiration should

be prevented from accumulating. The unpleasant odor which stockings or socks acquire in the ordinary boots, should thus be prevented, and the foot should be kept comfortable, warm, and dry. To design a boot capable of meeting these requirements, was a problem full of difficulties, which, however, were mainly overcome by acting on the principles propounded in the Sanitary Woolen System; that was, to substitute, as far as is practicable, woolen material for leather, which is nearly impervious to vapor. The difference between the Sanatory Woolen, and the ordinary leather boot, is equal to that between the Sanatory and ordinary coats; as will be found on recurring to the use of the latter kind of boot after wearing the other for some time.

The best form of boot, on sanitary grounds, is one made, with the exception of the sole, entirely of woolen cloth, without any addition of leather. Another form, better calculated for muddy and very rough walking, has a narrow leather border all round, and a narrow piece of leather over the toes. This toe-piece should not reach back beyond the front part of the toes. The perspiration is most abundant between the toes, and at the angles of junction it is most injurious. The hinder extremities of the division between the toes, therefore, especially need ventilation.

The penetration of water from without, can do no harm when the feet are thus clad. On a fortnight's pedestrian tour, our party of eight persons wore thoroughly wet Sanatory Woolen boots for hours at a time, and we felt no inconvenience or discomfort; nor was there the least injury to the health of any

one in consequence of the wetting. In fact, if, after a long walk, the feet are swollen and fatigued,—by stepping into water, the sense of discomfort is quickly dispelled, and the vigor of the feet is renewed. The socks and interior woolen soles, which prolonged walking renders hard and stiff, become elastic again with the water, and feel like velvet to the feet.

The capacity of endurance of the feet, is much enhanced by encasing them in woolen instead of in the ordinary leather material. Of the eight members of the pedestrian party already referred to, not one became in the least footsore, although we frequently walked upwards of twenty miles a day during the fortnight. In another case, an acquaintance walked for fifteen hours in Sanatory Woolen boots without blistering his feet.

As the boots should fit quite closely at the ankle, and as “side springs” are objectionable, from causing perspiration and impeding evaporation,—the “lace-up” form is chosen, reaching to the calf of the leg. With a little practice, lacing-up soon becomes easy to those who are not already accustomed to it, and it is the only correct method of making the boot fit closely.

Another material for boots which possesses great sanitary advantages, is leather made from undyed buckskin. I have tried this, now, for some time, both in dry and wet weather, and I can state that in point of durability it considerably surpasses ordinary shoe leather. Buckskin leather is, of course, not impervious to water; but the feet remain, even when the boots are wet, not only as warm as in wet woolen boots, but perceptibly warmer, probably because the

cloth of the latter has been dyed. This is so notably the case that it is positively pleasant to put on the buckskin leather boots when they have been freshly washed and are still wet. I can therefore recommend buckskin leather for the feet nearly as strongly as woolen material, especially for ladies' ball-toilet. The ladies of my family are greatly pleased with their buckskin leather dancing-shoes. A few decades since, such shoes were the fashion.

Another important point is, that the impregnation of tanned leather with a proper composition of mineral grease, prevents it from being tainted with the perspiration of the feet, and renders it soft, pliable, and perfectly water-tight. This last is a doubtful advantage; but I have arrived at the conclusion, after wearing high boots made of leather thus impregnated, but lined with undyed woolen material, for some time, that the objection is of less importance than I had previously supposed. At all events, if water-proof boots are required, those impregnated with mineral grease, which will not become rancid, are far preferable to such as are treated with animal grease, which does become rancid.

An important question in connection with this subject, is the material that should be used for blacking the leather. By mixing indigo with mineral grease, a blacking is obtained which gives the leather an excellent appearance without injuring its sanitary qualities. The dust, however, is more apt to cling to the leather than when ordinary polish is used; but this objection is minimized by the consideration that in dusty weather Sanatory Woolen boots without a bordering of leather should be used. The leather border

is only for dirty weather. Moreover, if the boot, about ten minutes after the blacking has been rubbed into the leather, be brushed up, the tendency of the dust to cling is lessened, and the general effect is excellent.

As regards the sole of the Sanatory boot,—the inner surface must be of leather, to give the requisite consistency. This, therefore, together with the leather stiffening at the back of the boot, which preserves its shape, is impregnated with mineral grease, to prevent taint from perspiration. Furthermore: holes can be drilled through both these portions of the boot, and between the leather surface at the bottom of the boot and the outside sole, a layer of felt inserted, into which the perspiration from the sole of the foot passes through the drilled holes. An outlet from the layer of felt to the open air is provided in the heel of the boot. The loose, woolen sole, which can be changed and washed when there is much perspiration from the feet, presses into the apertures drilled through the leather surface at the bottom of the boot, and thus obtains a better hold.*

THE CLEANSING OF THE OUTER CLOTHING AND BEDDING.

(1882.)

IT is not claimed that the Sanatory Woolen System reform has reached, or will reach, a stage of absolute perfection; the object kept steadily in view,

* In the latest, and by far the best pattern of the Jaeger shoe, the leather insole is discarded altogether, and a second, felt insole substituted, which, in every way, adds to the value of the shoe.—EDITOR.

is to replace what is bad by "good," what is good by "better," and what is better by "better still." This becomes apparent when the subject of the above heading comes to be considered. The endeavor to provide clothing and bedding, which will not retain the "noxious" portions of the body's exhalations, cannot entirely succeed, whatever progress may be made.

The linen or cotton shirt becomes unwholesome in two or three days, or, after copious perspiration, in as many hours, and the feeling of discomfort and aversion which it causes warns the wearer that the shirt must be washed. It must not be supposed, however, that, apart from other considerations, the Sanatory Woolen shirt could be worn unwashed indefinitely without a similar sense of discomfort setting in; this must come at last, although the period which would elapse before it would be felt is considerably longer than it would be with a linen or cotton shirt.

As regards the outer clothing,—whoever, like myself, has worn such of linen or cotton, knows that, after a few days, it requires washing. Ordinary woolen outer clothing is made externally of wool, and internally is lined with vegetable fibre. The outer, woolen surface is much less liable to attract dirt than is vegetable fibre; and as most people are chiefly concerned for their exterior, they seldom or never cause the outer clothing to be cleansed; not considering that a regular Augean stable of offensive odors, dangerous to health, collects in the linen and cotton linings.

This condition of things has been greatly amelio-

rated by the Sanitary Woolen System, which discards the offensive, vegetable fibre. But, even so, perfection has not been attained; and there comes a time when the degree of concentration of the accumulated odor of the body's exhalations in the Sanatory Woolen outer clothing, makes it necessary that it should undergo a cleansing process. I refer the reader to my remarks on the concentration of odor, in the essay on "The Nature of Disease," page 49. The only difference between outer clothing and under-clothing in this respect is that the latter requires cleansing sooner than the former.

The relation which this question bears to that of the effect of colors on health, which I discuss elsewhere, is simple. The color of the outer clothing is not the sole factor, but an essential one, in determining the necessity for the cleansing process; and my investigations leave no room for doubt that, from a hygienic point of view, the necessity is greatest with black color or dye, and least with wool which is completely free from dye. As natural wool is white, and brown, and white wool *appears* sooner to require cleansing than the brown does, the highest rank must be awarded to natural brown wool.

The practical question for present consideration is, when and how should the outer clothing and bedding be cleansed?

As to when: I answer, so soon as there is the slightest intimation of disturbance in the health or general condition; whether it be in the form of headache, toothache, heartburn, rheumatism, catarrh, sleeplessness, or disinclination to work. As to how: if the clothing or bedding be dirty, it should be

washed. If, however, it be free from apparent dirt, deodorization with ozogen (or effectually and more cheaply with camphor) will suffice. The process is the simplest conceivable. The bedding can be placed, in the morning, in a chest in which camphor has been deposited, or ozogen has been sprinkled. Two hours before bedtime, the bedding should be taken out, to allow the smell of camphor or ozogen to evaporate, and the process is finished. The clothing may be placed in a receptacle over night with camphor, and in the morning it will be cleansed.

THE TREATMENT OF INFANTS.

(1882.)

THE subject of bathing in connection with the Sanitary Woolen System, which is treated of in the essay headed "Cold Baths," (see page 137,) has been raised in another form, by a lady who addresses me from Helsingfors, (Finland,) with reference to her eight-months-old child, whom she has brought up under the Sanitary Woolen System since its third month. I will enumerate my correspondent's inquiries, and append my replies in a similar sequence.

1. May the child, when in health, be bathed more than once a week?

2. Must the child be wrapped, after the bath, in damp, warm, woolen clothes? How long should it be kept in them, and what is the effect? *Should the child be first well dried before the clothes are applied?*

3. The child's sleep appears frequently to be disturbed by dreams, so that it groans, (as after a fit of crying,) or laughs aloud. Is there any remedy for this?

4. I am told that the child will be enervated by the woolen clothing, and not sufficiently hardened against catching cold. There have certainly, from time to time, been attacks of cough and cold, but these have always been light, and have quickly passed away.

ANSWERS.

1. In health-culture there should be no rule of thumb. Everything should be decided by the consideration of what is necessary. A child should be bathed when it really requires a general cleansing, and in summer when it suffers from heat.

2. With infants, as with adults, it usually suffices to place the dry woolen cloths, or clothing, over the dripping wet body. Only when the air is hot and dry should the woolen cloths, or underclothing, be directly wetted. It is simply a question of reproducing as nearly as possible the conditions under which the mammiferous animals bathe. Their coats take up little water because they are not felted, as are, unfortunately, the materials of our clothing; and their hair is freely lubricated with fatty matter. A dog, on leaving the water, shakes itself, and in the course of half an hour to an hour is dry. Dogs can therefore bathe at any season, but in the cold of winter they require a sufficient amount of violent exercise to dry the coat in proper time, since, to remain wet too long is unhealthy for animals also. Man should be

guided by these considerations, and manage so that, after bathing, there shall be as much water in the under-clothing as will dry in the course of half an hour to an hour, not more and not less. Practice soon makes this easy. In Finland, where the climate is affected by the propinquity of the sea, the placing of the dry shirt and outer clothing on the dripping-wet body, would, probably, at all seasons be sufficient; while in Vienna, Pesth, or in the interior of Russia, where the air is hot and dry, the clothing should be directly wetted, in order to secure the full enjoyment of the bath without detrimental consequences.

3. The child's sleep will cease to be restless when its health is no longer disturbed by excessive bathing.

4. If nothing worse has ailed a child, from its third to its eighth month, than light and evanescent attacks of cough and cold, notwithstanding the mistakes made in bathing it; and if, as is stated, the child's health be normal, what more can be desired? It should be remembered that thirty to forty per cent. of children die in the first year, and that an equal percentage suffer severe illnesses.

Here may be inserted a communication received by Dr. G. Jaeger, some months after the foregoing was first printed:

"The writer, feeling convinced of the value of the Sanitary Woolen System, procured, in anticipation of the approaching birth of a child, an entire woolen outfit for the newly-born baby, which from its first existence has never worn a particle of linen. The appearance of the child, now six months old, is all

that could be wished; its limbs are agile and strong, the body is round, the flesh firm, and, in short, the child is as healthy as it can possibly be.

“As to the practical worth of the Sanitary Woolen System, the writer has noted down the opinions of the monthly nurse, a woman of twenty years’ experience, as of more value than a great deal of theorizing one way or the other. At first the whole thing appeared to her ridiculous, and she used the various woolen articles with reluctance; but after some time she expressed herself as follows:

“‘Although I am poor, and have brought up six children in linen, I would not hesitate to clothe the next in wool, for it gives only half the trouble of linen. The colds which babies so frequently catch are completely prevented by the equable and sustained warmth of the woolen clothing, which is of the greatest importance, since so little heat is generated in the body itself; this particularly applies to the wet clothes which, when of linen, grow cold on the body, while the woolen ones remain warm. Another advantage is the time and labor saved in ironing. The washing of the clothes is simpler and quicker, and that of the frocks and shifts is not required so often, and it is surprising how long they keep clean and free from smell. I also notice that daily bathing and soaping do a child more harm than good. This child was best when simply washed, without soap, each day, and afterwards lightly rubbed with a woolen rag, soaked in olive oil; it was only bathed once a week. I intend to recommend the bringing-up of children in wool wherever I can.

“To this may be added, that when the child was

out of doors for some time the cloths which it wetted frequently dried on the way, a proof of the rapid evaporation; moreover, they *were free from odor*.

“In conclusion, the cost was about the same as of a linen outfit, having regard to the fact that only half the usual number of articles was necessary.”

VEGETARIANISM.

(1882.)

THAT whatever is practically good and true finds its greatest enemy in doctrinism, (over which, however, it invariably triumphs in the end,) is an old story that recurs to me with especial vividness in connection with this subject. My first acquaintance with vegetarianism was in the form of the following doctrine:

“According to the construction of his teeth, the nature of his digestive organs, and his systematic conformation, man belongs to the genus ape, especially to that of the so-called man-ape. As these animals are frugivora (fruit-eating), the fruits of the earth must be the natural nourishment of man, for whom meat is unnatural food.”

I have always opposed this doctrine, on the ground of practical experience, a part of which I will here briefly relate.

I was for nearly five years the technical and scientific director of a zoölogical garden, and I found that few animals presented so many difficulties, in respect to frailty of health, as the apes. When I entered on my duties I found that the apes were treated as fru-

givora; *i. e.*, were fed with vegetables, onions, carrots, rice, potatoes, etc.; but milk also was given to them. The result of this diet was, as stated in the journal of the Frankfort Zoölogical Garden, an annual mortality of 50 per cent.! The chief, and, indeed, exclusive, cause of death was pulmonary consumption.

The following observation induced me to adopt another method: I had two mandrills, which soon after their arrival showed every symptom of consumption, phthisis. As I was watching them one day, a mandrill quickly seized a mouse that came through a hole into the cage, and devoured it with extraordinary avidity.

I was reminded by this incident (1) of the success which I had had in treating two tuberculous patients with the so-called "cold preparation" of Liebig's extract of meat; *i. e.*, a solution of meat in $\frac{1}{1000}$ of muriatic acid—by no means to be confounded with the Liebig's extract ordinarily sold; (2) that the cravings of the sick are nature's hints, to which the physician should always attend.

From that time I treated all my apes as omnivora, or general eaters; and the result was remarkable. Of the mandrills—one, indeed, died after a few weeks, full of tubercles, but the other recovered and survived for over a year. An examination after its death, showed that the growth of the tubercles had been arrested, and that the cause of death was heart disease. The main point, however, was that the total mortality of the apes was reduced from 50 per cent. to 20 per cent. On my recommendation, my colleagues in the other zoölogical gardens in Germany, adopted the same system, with a similar result. To this, may

be added that apes in a wild state are by no means exclusively frugivorous, but eager and alert to devour all kinds of insects, worms, snails, birds' eggs, young birds, mice, etc.

I was therefore firmly convinced that the vegetarian doctrine is erroneous; and I was strengthened in this view by the fact that my chronic dyspepsia appreciably improved when I began to avoid potatoes, and farinaceous and leguminous foods, (from which I suffer most inconvenience,) and to keep more strictly to a meat diet.

This was my position on the question of Vegetarianism at the time that I made my researches into the action of odorous matters, and published my theory of the Sanitary Woolen System. Here, again, intrusive doctrinism at once showed its hostility to what is practically good. The Sanitary Woolen System was vehemently attacked by the doctrinists of vegetarianism. The attack, however, availed as little as did the doctrinary assaults which were made from other quarters. The practical value of the system forced recognition, and not from the "omnivora" alone, but especially from vegetarians, in spite of the opposition of their doctrinary leaders; so that, a year ago, the admission was made in the vegetarian journal, the *Naturarzt*, that the Sanitary Woolen System had become a power which must be taken into account.

I have, since, been continually in communication, both personally and by correspondence, with vegetarians; luckily not with the doctrinarians, but with common-sense, rational people, whose maxim is, "Examine everything and retain the best." From the

communications I thus received, detailing personal, practical experience, which I value higher than any doctrine, I arrived at the conclusion that the doctrinal and the practical aspects of vegetarianism are not in congruity—that is to say,—the vegetarian mode of life can show great practical results, although the doctrinal foundation on which it rests is erroneous. These communications, together with my progress in knowledge respecting the nature of disease, and cure, and the practical experience, (now first fully comprehended,) which I had had, as medical superintendent, with animals, at the zoölogical gardens, greatly changed my attitude towards vegetarianism; and assisted me to a different and, I believe, a more scientifically correct, fundamental reason for the vegetarian mode of life.

My readers are familiar with my maxim, “Disease is stench;” *i. e.*, everything malodorous either causes or disposes to disease; and this tendency is enhanced in proportion to the offensiveness of the odor.* The cages in any zoölogical garden or menagerie afford ready proof that the excrement of the carnivora is more offensive than that of the frugivora. The general experience with dogs shows that this difference

* The pithiness of the epigram is somewhat at the cost of scientific accuracy, as the succeeding “*i. e.*” partly discloses. Disease is not strictly stench, nor is stench disease, or even, except mediately, the cause of disease, but only an indication of the presence of substances possessing morbid properties. It seems proper to state this explicitly, since the shadow of the Doctor’s maxim rests upon other passages in his book. Neither is it in entire accord with the Doctor’s own language in the fifth paragraph of his chapter on the Deodorization of the body.—EDITOR.

does not proceed from the specifically diverse natures of carnivora and frugivora, but from their different kinds of food. The exhalations from dogs, especially big dogs, that are fed with meat, are so offensive that the animals cannot be endured in a room; and it is an almost universal rule to feed watch-dogs only with meat, and to confine house-dogs to a vegetarian diet, *although such is not their natural food*. It might be supposed that this unnatural nutriment would disagree with house-dogs, but precisely the contrary is the case: those dogs (chiefly the little ones, the exhalations of which are less pungent) fed with meat are in no way healthier than those that are compulsory vegetarians; on the contrary, the former have a disposition to eruptive diseases, digestive complaints, inflammatory disorders, hemorrhoids, etc.

The popular expression for these well-known facts is that "meat is too heating for dogs;" and yet no one will dispute that dogs, as appertaining to the fox and wolf species, with similar formation of the teeth, intestines, etc., are naturally carnivorous. The explanation of this apparent contradiction is, that every creature has its so-called natural food; but as soon as it is withdrawn from its natural surroundings, and placed in a condition which is not natural to it, a change of diet is necessary. This is especially true of the carnivora, but it is also true of the frugivora. For instance, it is well known to cattle-breeders, that hay is more wholesome for stalled cattle than green food, and yet the latter is their natural nutriment.

To man's physical nature the same laws apply as to that of the lower animals, as any one who is not already convinced can prove by personal observation.

The odor of the evacuations, as well as of the exhalations, is much less pungent when the diet is vegetarian than when the body is nourished on meat. This greater exemption from offensive matter I consider to be the cause of the undeniable benefits of the vegetarian mode of living in numerous cases of illness; and it is this fact which gives it (vegetarianism) its hygienic importance; for, as with the house-dog, so with most civilized men, they live within four walls, and are thus liable to be injuriously affected by their own exhalations in proportion to their malodorousness.

Vegetarianism, therefore, contends, (although this has not hitherto been clearly perceived,) with the same enemy that is assailed by the Sanitary Woolen System; and it is for this reason, in the natural order of things, that among vegetarians the system at once found enthusiastic adherents. The "noxious" emanations of the body were the primary cause of vegetarianism; and some sufferers found therein a remedy for their complaints; while others, when the external and internal conditions were less favorable, experienced only alleviation; and these latter, with an unerring instinct, adopted the Sanitary Woolen System as a means of completing their cure.

To the question whether, on the foregoing grounds, I recommend vegetarianism, I can reply neither in the affirmative nor the negative, for the following reasons :

The suitability of a particular form of nutriment to man, cannot be decided solely by the nature of the emanations which it evolves; the degree of its digestibility, and of its nutritious quality, must be taken

into account. In these respects flesh foods, as a class, are distinctly superior to vegetable foods; although very fat meat is more difficult of digestion than many kinds of fruit, and, in point of nutritiousness, legumes are very little inferior to meat; but, on the whole, the above statement (as to the greater nutritiousness of flesh foods) holds good. When, therefore, the conditions of time or space require that the nutriment should be intensive, meat is distinctly more effectual than a purely vegetable diet; and the majority of vegetarians have practically admitted the inadequacy of the latter, by adopting two of the most nourishing and easily digested animal foods—milk and eggs.

I, therefore, go thus far with vegetarianism: For those who suffer from the evolution of the “noxious” emanations, two courses are open—the Sanitary Woolen System, and vegetarianism. Either or both may be chosen. I consider that vegetarianism is especially suited to the constitutions of people who lead indoor lives, and the lightness of whose occupation, creates in the body a relatively small need of nourishment; in short, people whose calling compels them to be idle indoors—as, for instance, persons who have frequently to wait in a condition of complete inactivity for orders from their chiefs; or those who have only a light, unvaried occupation, as copying, sewing, knitting, reading, etc.

On the other hand, I should dissuade those who work hard, physically or mentally, or who, on other grounds, require easily digested, intensive nutriment,—both, from a purely vegetarian mode of living, and from confining themselves to an exclusively

meat diet; such persons require a mixed diet, and the regimen of the Sanitary Woolen System.

Between the extremes of hard, and light workers, there will be many cases in which I can give the advice only, both as to vegetarianism and the Sanitary Woolen System, which I myself have always followed to advantage, "Examine everything and retain the best." I have been reproached with riding an excellent principle to death; but my only principle is the foregoing maxim, and I admit that I am willing to ride this at all times. My practice, as a public teacher and adviser, is not to recommend that which I and many others have recognized as the best, with a demand for unconditional acceptance, and submission to my authority; I simply say, "Here is something which many have approved, and which is, therefore, worthy of trial by others." I ask only that the trial shall be correct and thorough. This is my position in reference to the Sanitary Woolen System, and from this standpoint I have discussed vegetarianism.

THE POSITIVE AND NEGATIVE EFFECTS OF THE SANITARY WOOLEN SYSTEM.

(1883.)

WHOEVER has read my publications on the Sanitary Woolen System, must be aware of the fact that I have never claimed for it that it is a universal remedy, or that it protects against every disease. As I find that the contrary is frequently asserted, I will now state what experience has so far shown that the Sanitary System cannot do.

As regards the prevention of disease, a person who is suffering from any disorder, and who adopts the System, is not immediately enabled to resist the influences of weather, of infection, or of the emotions. The System must first aid the body to expel the disorder. Even when the cure is not complete, the System perceptibly increases the power of resistance to the above-named influences, but cannot possibly make it perfect. If the cure be complete, then—and all experience, so far, confirms this—the resistance to influences of weather and temperature is exactly equal to that which is possessed by the domestic animals,—neither greater nor less.

Respecting the power of resisting infection, I have constantly made the qualification that this power does not apply equally to every kind of infection; the so-called abdominal, infectious diseases, (cholera, typhus, dysentery,) are those against which the Sanitary Woolen System principally protects. Against infectious diseases of the skin, the System affords only a modified protection; and as regards its action in cases of *chronic*, infectious disease, I have refrained from expressing any opinion.

This was my position from the first, and I have never swerved from it. Against some diseases the Sanitary Woolen System affords no protection. I know that it has not availed against heart disease, nor against diabetes, as to the origin of which so little is yet ascertained. Of course, the System is powerless to prevent the evil effects of illness arising from the continued use of unwholesome food, or from inhaling poisonous vapors; in other words, it does not protect the body against all diseases due to extra-

neous influences, but against the evil effects of its own "noxious" exhalations.

[Any one that has attentively read Dr. Jaeger's book, will see, at once, that he here concedes too much against his System—that he claims less for it than it is entitled to, when he says, there are some diseases to which it affords *no* protection. The plain implication of his fundamental proposition is against the concession. While it cannot avail to *cure* heart disease or diabetes, it is evident that even these diseases must be in some degree subject to the general condition of the body, either in its tendency to succumb to perturbing influences, or its ability to resist them. —EDITOR.]

The remedial power of the Sanitary Woolen System may be summed up as follows :

1. The Sanitary Woolen System cure runs its course similarly to all so-called constitutional cures; *i. e.*, those which act upon the constitution. The necessity of expelling a disease through the secretions of the body may give rise to "critical" symptoms, in the form of an acute attack of illness; and, as with all constitutional methods of cure, it may happen that the patient will succumb.

2. The complaints which have proved most readily susceptible to the remedial effects of the Sanitary Woolen System, are precisely those which have been most obstinate, when treated according to the methods previously known. I refer to purely nervous disorders; next to which comes the group of catarrhal and rheumatic complaints. Of the more localized diseases of the internal organs, the most susceptible to the System have been lung affections, including tubercles.

The greater obstinacy is shown by diseases of the liver; and by many, although not by all, diseases of the kidneys. Diabetes withstands the System, both as a preventive and a cure. The System prevents chlorosis, but will not cure it, although it powerfully contributes to that end.

Lastly, the tonsils resist the remedial power of the Sanitary Woolen System; and as the delicacy of these organs constitutes, in my own case, the obstacle to my attainment of constant, equable health, I will treat of them somewhat more in detail.

Just as certain, natural, cyclic, bodily incidents are repeated at regular periods; so there are some cyclic disorders, which, without any apparent cause, recur at more or less definite intervals, and which are further distinguished by the circumstance that they are hereditary. The most characteristic complaint of this class is inflammation of the tonsils, a tendency to which was transmitted to me by my mother, while two of my children inherit from me. As a rule, this inherited tendency is first revealed at the period of puberty; and such was the case with myself and my two children. After that age, I suffered every winter from an acute attack of inflammation of the tonsils or the throat.

Since I have adopted the Sanitary Woolen System, the complaint is no longer of an inflammatory nature, but it has assumed a catarrhal form, which I ascribe partly to the incomplete carrying-out of the System during the course of its development, and partly to external, injurious influences, such as the condition of the atmosphere, etc. I was curious as to what would be the experience of the approaching winter,

the first in which I had carried out the System in its entirety. This thoroughness notwithstanding, the complaint returned at the usual period, without appreciable cause, so that I now look upon it as the remainder of an inherited tendency to cyclically recurrent inflammation of the tonsils.

This winter the attack was unprecedentedly mild, so much so that it did not prevent me, in February, on the occasion of a visit to Dresden, from speaking, with only one hour's interruption, incessantly from 2 P.M. to 4 A.M.; at 9 A.M. I resumed discussion, my voice being quite unaffected until 6 P.M.; and again, in the train, from 2 to 7 in the early morning. Another week I spoke, on Monday, for eight and a half hours; on Thursday for seventeen hours, with an intermission of two and a half hours; on Friday for nineteen hours, without intermission. During this time my voice was husky, and occasionally hoarse; but it sustained no injury from the unusual exertion. I may add that my total allowance of sleep from Monday to the following Saturday was twenty-five hours.

My two children, who have inherited this delicacy of the tonsils from me, also felt none of its effects until they reached the age of puberty, when, in one case, it took the form of an affection of the tonsils and larynx, with feverish symptoms; but soon changed into chronic hoarseness, free from all fever; in the other case, there was, from the first, an entire absence of feverish symptoms, as is now the case with myself.

Another of my children, who arrived at adult years some time ago, was similarly troubled during the

period of youth, but has long been free from the disorder. This proves that in the case of myself and my two children, who first suffered from this complaint when we were adolescent, the cause does not lie in a faulty mode of living, and is too deeply implanted in the constitution to be prevented or cured by any particular system.

VEGETABLE FIBRE, WHEN AND WHY UNSANATORY.

(1884.)

THE sanitary objections to materials of vegetable fibre are patent from the following facts :

1. Every sick person gives forth a malodorous exhalation; a proof of this is afforded in the attraction of flies, which are allured by matter which has become malodorous.

2. An offensive atmosphere, especially when it has become so through human exhalations, is a well-known cause of illness.

3. Bacteria are "koprophilous" parasites, which multiply in solutions of offensive-smelling nutriment.

4. *Living* plants are "koprophagous," attracting all evil odors, and assimilating them. The influence of vegetation in purifying the air has long been recognized.

5. *Dead* vegetable fibre has a similar power of absorbing evil odors; as, however, it cannot *assimilate* them, the ordinary laws of gas-absorption prevail; *i.e.*, the absorption is greatest under conditions of

cold, and the odors are again exhaled when the fibre is warmed or wetted. Clothing, bedding, and, generally, all material of vegetable fibre, while cold, (*i. e.*, not in use,) and placed in the atmosphere of human beings, attract the malodorous exhalations until no more can be absorbed; as soon as such clothing, bedding, etc., come in contact with the warm body, these emanations are given off in proportion to the degree of temperature. This directly induces spasmodic action of the capillaries of the skin, (a feeling of chill,) and the atmosphere breathed is corrupted. Both effects are intensified when the fibre is damp. Wet, unvarnished, or unpainted wooden floors, and damp linen or cotton shirts, or bedding, are notoriously dangerous to health.

6. Just as living, animal substance, when at rest, stores up oxygen, so, under similar conditions, it stores up the noxious emanations proceeding from the digested food; but while the chlorophyl of living vegetable fibre assimilates such emanations, the living animal substance does not possess that faculty. These noxious emanations therefore readily become disengaged in the body, (especially when there is excessive internal heat,) and permeate the tissues and juices, inducing similar phenomena to those caused by the direct inhalation of malodorous air; viz., spasmodic action of the capillaries of the skin, with feverish shivering while the spasms last. Further, the insufficient throwing-off, by the skin, of the internal warmth is felt, when the spasms subside, as febrile heat on the surface. The retention of the noxious emanations which proceed from the digested food, is thus tantamount to a disposition to feverish sickness.

7. The retention of the emanations which proceed from the digested food, also gives rise to the so-called ferment diseases; as they impart to the juices of the body the fœcal taint which these "koprophilous" ferments require.

8. Whoever, therefore, uses clothing, bedding, and materials of vegetable fibre, not sanitarily treated, is continually exposed to the danger involved by the retention of the emanations from the digested food; and this danger is avoided as soon as use is made of animal fibre only, or of such vegetable fibre as has been impregnated with fatty or resinous matter; that is, with matter which is not soluble in water; and so rendered incapable of absorbing evil odors.

ABOUT SHRINKAGE.

THERE is no absolutely unmixed good. There are spots on the sun. It is the brightest light that casts the darkest shadow. Even the all-wool garment is not exempt from this universal law. The very structure that gives the woolen fibre its great superiority over all other clothing materials, is the cause of its only defect—its liability to shrink. To shrink is a possibility to every woolen fabric. It inheres in its very substance. To remove this possibility implies the destruction of the fibre itself—or, at least, of all that is valuable in it from a hygienic point of view. The problem is to reduce this shrinking tendency to a minimum. This can be done only by recognizing the *modus operandi* of the process, and by observing the known methods of counteracting it. The shrinking of woolen is a "fulling" or "felting" process—

due chiefly to the imbrications, or so-called "scales," characteristic of the ultimate fibre, and partly to its spiral form. The transverse lines on the fibres, as shown in the microscopic view, fig. I. page 202, represent the scales above referred to. Some idea of the extent to which these fibres are magnified, may be inferred from the fact that the scales vary in number according to the fineness of the wool, from 1,800 to nearly 4,000 to the inch. The thickness of these scales at their free edges, does not exceed $\frac{1}{100,000}$ of an inch. And yet it is to the interlocking of these scales, when set in opposite directions, that fulling, felting, and *shrinking*, are due. Moved upon one another in the direction of their bases, the scales glide over each other easily; drawn in the opposite direction, they interlock, and arrest the movement. Now it is obvious why all possible manipulation of the fabric, such as rubbing, wringing, kneading, should be strictly guarded against. (See microscopic views on pages 202, 203.)—EDITOR.

The following washing directions are based upon the above-described properties of the woolen fibre:

WASHING.

THE clothes should be placed to soak in water (at about 100° Fahr.—as hot as can be borne by the hand) in which soap has been boiled.

To about every six gallons of water (or sufficient for washing six large garments and several smaller articles) add three tablespoonfuls of liquid ammonia, which removes grease deposited by perspiration.

Any good soap may be used, but Ammonia Soap,

which combines ammonia in the proper proportion, is recommended. It is supplied by the Company at 40c. for a tin can of 2 lbs. The proportion to be used is $\frac{3}{4}$ lb. to 6 gallons of water.

Cover the clothes well, as the retained heat assists the removal of grease.

After an hour's soaking, wash out, by drawing through the hand. *Avoid rubbing.* Very dirty spots should be brushed with a soft brush.

Rinse in water at the same temperature as that given above, as many times as may be necessary thoroughly to remove the soap.

It will greatly contribute to the desired result, to wash, rinse and *dry* the garments in the same temperature, without variation from the beginning to the end.

The use of a wringer is recommended, as it expels the water with the least friction.

Hang the clothes up lengthways to dry.

Iron *while still damp*, stretching the article to the necessary length and width. The iron should not be unnecessarily hot.

No soda or lye should be used.

The odor of the ammonia disappears when the soap has been removed.

NOTE.—Experience has shown that the shrinking of Woolen Clothing is influenced by the nature of the perspiration given off by the wearer; especially when the clothing is first adopted, and its saluary effect causes the skin to expel the excretions previously repressed and retained.

"THE FRAUD DETECTED."

SANATORY WOOLENS VERSUS FRAUDULENT IMITATIONS.

“WHENEVER there is put upon the market a new commodity which proves to be better than anything in the same line preceding it, and which wins its way to popular favor, it is pretty sure to have, soon, to compete with imitations. In no instance has this fact been more strikingly illustrated than in the case of the Sanatory Woolens of the Jaeger System. The imitations are so numerous, that it may be said, their name is legion. Goods offered as all-wool, ‘Jaeger’ underwear, stamped with the word ‘Normal’—the property of the Jaeger System—and purporting to come from Stuttgart, the source of the genuine Jaeger importations—with other devices calculated to deceive, can be found in almost every city in the United States. One of these has been sent to the Jaeger Sanitary Woolen System Company, at 827 and 829 Broadway, for analysis—the only way in which the fraud can be detected, since the ultimate fibres of the wool and cotton are combined in the same thread. This analysis is done chemically and by the microscope. Under a glass of from 300 to 500-diameter power, the Jaeger wool filaments are clearly seen to be all alike in all general characteristics. They are shown to be tubular, and cylindrical in form, and to be marked with wavy, transverse lines, denoting the imbricated scales, upon which the property of felting depends. On the other

hand, the cotton fibre is tape-like, resembling a flattened tube, devoid of the cross lines, and generally somewhat twisted, like an auger. A tuft taken from the spurious article, so closely resembling the genuine that none but the most skilled expert would even suspect anything wrong, shows, under the glass, the woolen and cotton fibres interlaced, in the proportion of about $33\frac{1}{3}$ per cent. of the latter.

"But the chemical test is by far the more striking. A remnant of the Jaeger fabric, thrown into a strong, hot solution of caustic soda, wholly disappears in a few seconds, leaving only a brownish liquid behind—the discoloration being due to the decomposition of the dark-hued wool, which, when mixed with the white, gives the 'natural-gray' color.

"The almost pure gelatine, of which the woolen fibre is composed, is rapidly dissolved in the caustic solution, while upon the cotton fibre the solution has no appreciable effect. So, when a clipping from the imitation garment is immersed in the solution, the woolen component at once disappears, leaving a patch of well-woven, cotton network behind, looking very much like a piece of fine mosquito-bar. [*]

"The result shows not only the grossness of the fraud, but the ingenuity with which it is perpetrated."
—*The Daily Standard-Union*, Brooklyn, N. Y.

The cuts 1, 2 and 3 on pages 202, 203, represent microscopic views of the woolen and cotton fibres as revealed in the above-described analyses.

* When, in the adulterated fabric, the cotton fibre is not spun in with the woolen, the former will be found in the solution in the form of an entangled mass of filaments.

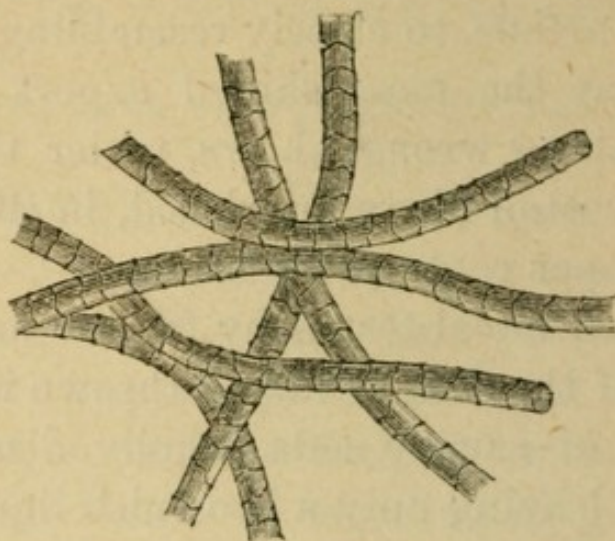


FIG. 1. WOOL FIBRES.

FIG. 1.—A microscopic view of woolen fibres taken from a Jaeger garment

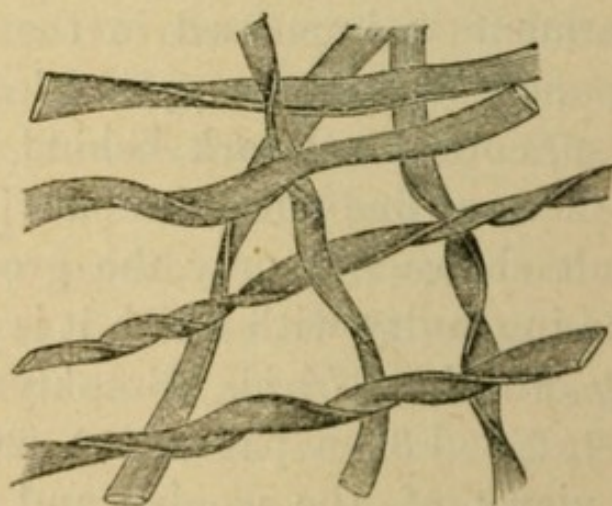


FIG. 2. — COTTON FIBRES.

FIG. 2.—A microscopic view of *cotton* fibres.

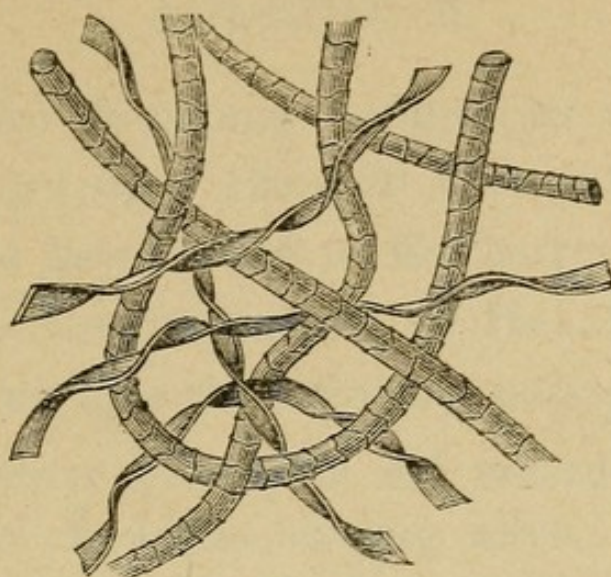


FIG. 3.

FIG. 3.—A microscopic view of woolen and cotton fibres mixed, taken from an imitation, "all-wool" garment. The true relative size of the cotton fibre is seen in Fig. 2.

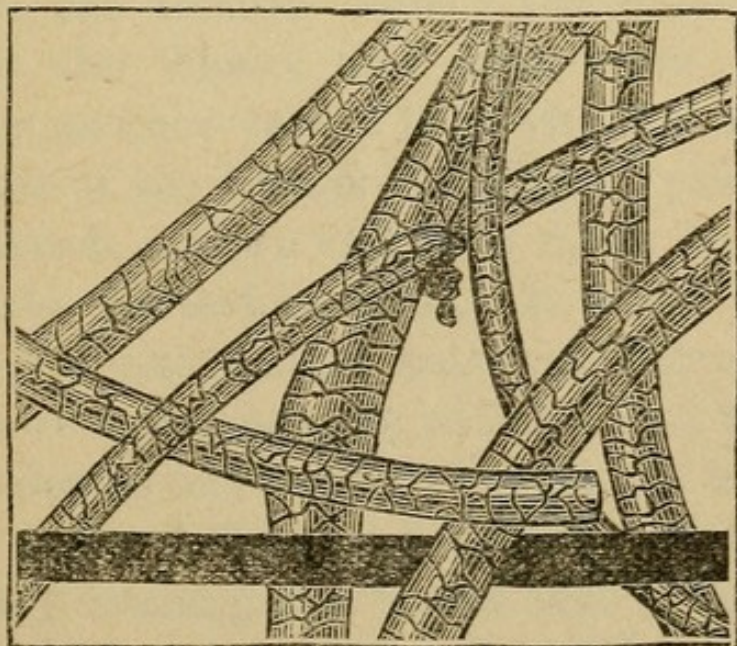
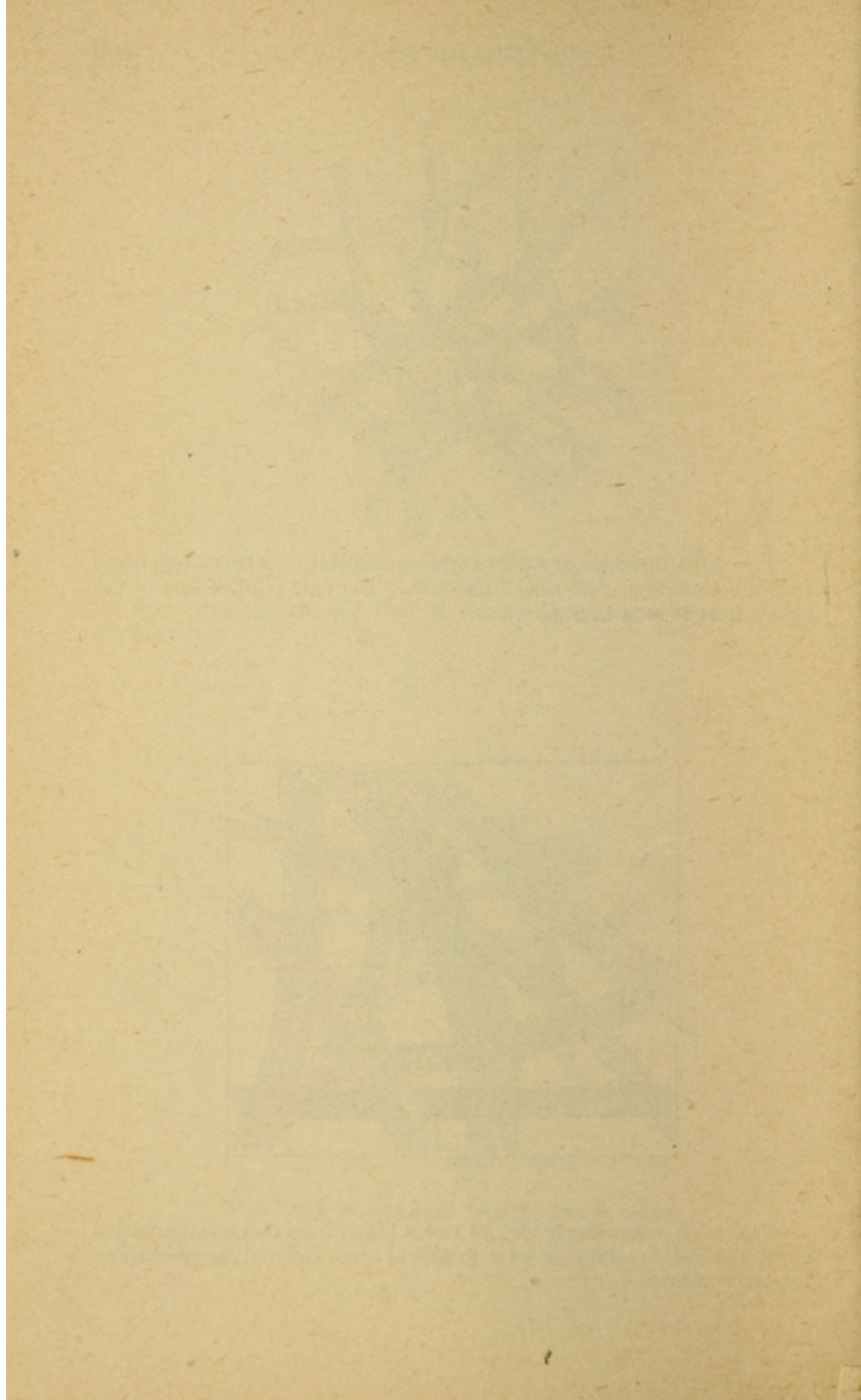


FIG. 4.

FIG. 4.—A microscopic view of fibres taken from an imitation fabric of inferior quality, showing seven grades of wool and a filament of some foreign substance.



ADDENDUM.

SINCE the foregoing paragraphs on fire-proof clothing (pages 120-122) were put in type, our attention has been called to the corresponding section in a late London edition of *HEALTH CULTURE*, from which we take the following passages :

“Every winter brings its sad record of that most terrible form of death, burning alive. So surely as the season arrives when candles are lighted and fires are kindled in open grates, the newspapers recount one horror after another. Young children, blooming girls, mothers of families, and the old, all are among the victims of ‘death by burning.’

“In a recent instance, one of two sisters, who were dressing for a ball, caught fire at the lighted candle on the toilette table ; the other tried to extinguish the flames, and both were burned to death. In another case, a lady who was walking in the grounds of the London Exhibition, passed over a flaming match, thrown carelessly down by a smoker, and was also burned to death. It would be easy to fill this book with similar authentic horrors ; but it will be more to the purpose to point out, that all the agonized deaths and saddened memories which have been due to the clothing and bedding of the victims accidentally catching fire, would have been avoided if the material of the clothing and bedding had been of animal wool, instead of vegetable fibre ; as, between these two classes of materials, there is a very great difference in respect to inflammability.”

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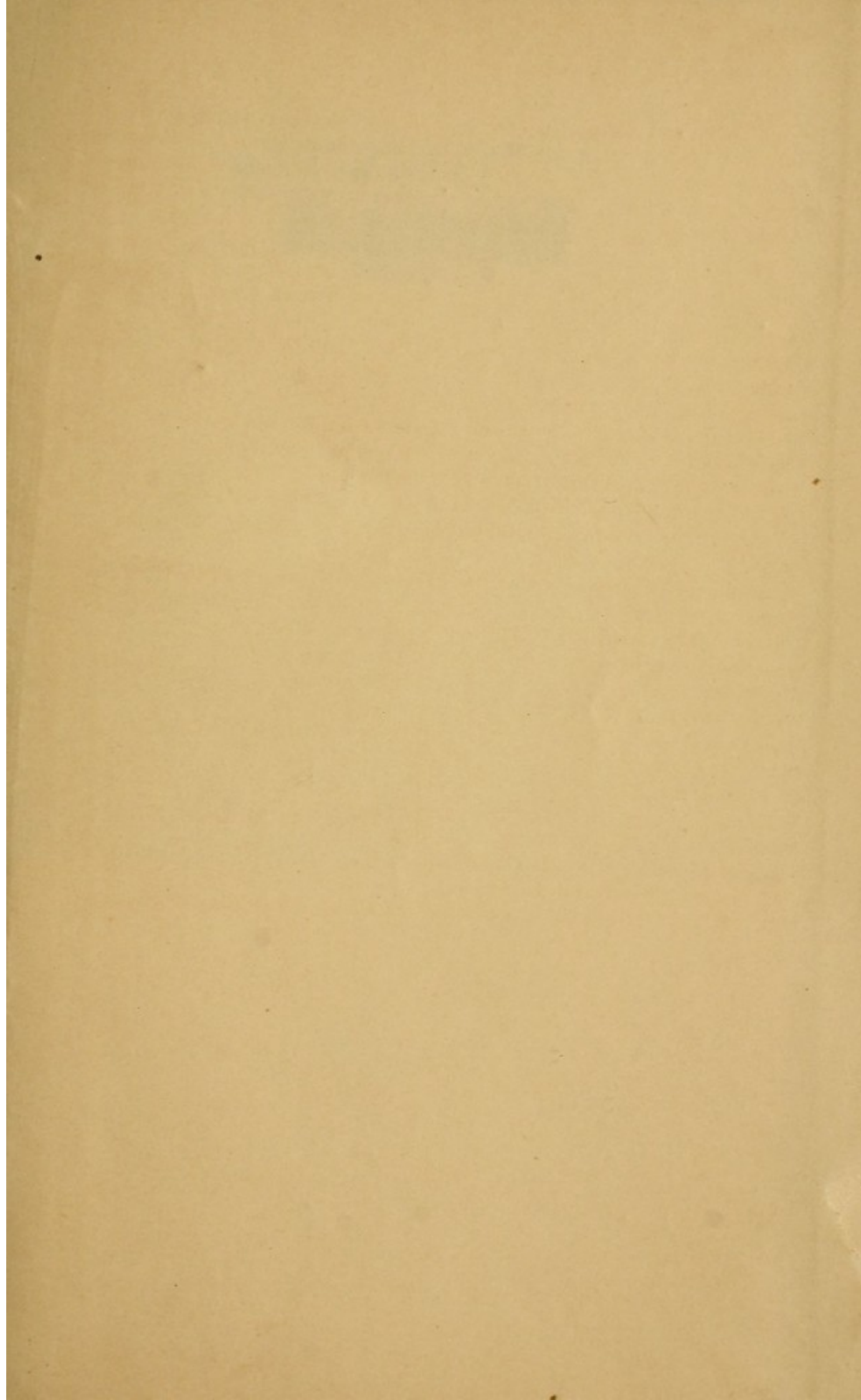
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