

do not pretend that they are absolutely correct, but as they have been ascertained under conditions similar to those now existing, the errors will not be very great.

In consequence of the field not being quite flat, and the sections having a certain thickness, although extremely thin in most cases, the whole of the object cannot be in focus upon the screen at the same time. By shifting the focusing screw slightly all parts may be brought into focus successively. So-called greater depth of focus is obtained by using an increased working distance; and for projection work over-correction for flatness can alone give a sharp picture all over with very considerable depth of focus: the difficulty of over-correction being that, unless extreme care is taken, certain forms of distortion may be introduced. By stopping down the objective greater flatness of field may be secured, but at the expense of light. There is thus a choice of difficulties, and the least one should be taken.

Turning now to the polariscope. Polarized light teaches us a great deal concerning the structure of matter; it is also a means of confirming the undulatory theory of light. This subject is so large that no attempt can be made to give even a general idea of the field it covers, and the experiments, which will be shown in the polariscope, may be taken simply as a few illustrations of the subject and nothing more; but they will, at any rate, be suggestive of the large field to which this method of analysis can be applied. A vast amount of mathematical proof can be illustrated graphically by various experiments with polarized light. I will show on the screen a diagram of the polariscope. (Shown.)

With reference to showing the spectrum. The method of projecting a spectrum, I think, is new, as I have not seen it described anywhere. It gives practically a direct spectrum with an ordinary prism, without turning the lantern round to an angle with the screen; and here is a diagram of the method.

The details of the apparatus, as well as those of the methods of working, I have modified in almost every instance, for five reasons: (1) That more certain results may be insured; (2) that rapidity may be obtained; (3) that only one operator may be needed; (4) that, as far as possible, all parts of the apparatus may be interchangeable; and (5) that loose screws and pieces may be dispensed with.

There were then shown by projection a number of slides illustrating various microscopic optical systems, and a number of microscopic slides, followed by a series of general polariscopic projections, some of them to illustrate the strains existing in many forms of matter; also a spectrum by a carbon disulphide prism, in conjunction with a reflecting prism and with a mirror, which, apart from any other result, demonstrates that the loss of light with a reflecting prism is less than with an ordinary glass mirror. Slides and other projections were also thrown upon the screen.

The details are as follows:

**The Microscope.**—Screen distance, 21 feet. First 35 millimeters Zeiss projection objective, 4-inch sub-stage condenser, Zeiss Huyghens eye piece 2; 500 diameters = 250,000 times = penny stamp stretched to cover about 147 square yards. Subjects shown: proboscis of blowfly; permanent molar displacing milk tooth (kitten); human scalp, vertical; human scalp, surface; fossil ammonites and belemnite. Second, 1-inch Newton's projection objective, 4-inch sub-stage condenser, Zeiss Huyghens eye piece 2; 1,000 diameters = 1,000,000 = stamp stretched to about 588 square yards. Objects shown: proboscis of blowfly; foot of a caterpillar; section of human skin, showing the sweat ducts; phylloxera vastatrix of the vine. Third, 1-inch Newton's projection objective, 4-inch sub-stage condenser, Zeiss Huyghens eye piece; 1,300 diameters = 1,690,000 times = stamp stretched to about one-fifth of an acre. Slides shown: proboscis of blowfly; wings of bee (showing hooklets and ridge); sting of bee (showing the two stings, sheath and poison sack); sting of wasp (showing same as last slide); eye of beetle (showing the facets). Fourth,  $\frac{1}{2}$ -inch Zeiss's achromatic objective: Abbe's 3-lens sub-stage condenser, with top lens removed; Zeiss Huyghens eye piece 3; 4,500 diameters = 20,250,000 times = stamp extended to nearly  $2\frac{1}{2}$  acres. Slides shown: proboscis of blowfly; hair of reindeer (showing cell structure); hair of Indian bat (showing the peculiar funnel-like structure); sting of bee (showing the barbs); foot of spider; stage of the micrometer (the closest lines ruled to thousandth of an inch, which measure  $\frac{1}{4}$  inches apart under this magnification); a wave length  $\frac{1}{1000}$  inch, therefore, on screen measures about  $\frac{1}{2}$  inch.

**The Polariscope.**—Shown with parallel light: plain glass; glass under pressure; chilled glass (round, oval, and waved peripheries); Prince Rupert's drop (broken in the field); horn; selenites (overlapped); butterfly (selenite); bunch of grapes (selenite); bi-quartz, with  $\frac{1}{4}$  wave plate (the  $\frac{1}{4}$  wave plate in this experiment produces the same effect upon the bi-quartz as if a column, 20 centimeters long of a  $7\frac{1}{2}$  per cent. solution of cane sugar were placed between the polarizing Nicol and the bi-quartz; the analyzer has to be rotated about 10 deg.); a piece of sapphire to show asterism. Shown with convergent light; hemitrope (cut in a plane, not at right angles to the axis); ruby, topaz, grape sugar (diabetic), cane sugar, quartz, superposed right and left handed quartz (spirals); calcite and phenakite superposed (showing transition from negative to positive crystal, passing through the apopholite stage).

**The Solidiscope.**—New form of apparatus for showing solids, and consisting of two reflecting prisms and suitable projecting lenses. With this instrument were shown, Barton's button, the works of a watch, a coin.

**Spectrum Analysis.**—Spectrum thrown by means of a disulphide prism combined with a reflecting prism; the result being that a good spectrum is thrown upon the screen direct without turning the lantern. There were shown: The spectrum; absorption bands of chlorophyll, etc.; effects produced by passing the light through colored gelatine films.

**Projection of Slides.**—Decomposition of water; expansion of a wire by means of heat; combination of colors to form white light; various diagrams, colored photographs of a workshop, etc. As an extra experiment there was shown, in the polariscope, with a con-

vergent light, Mitscherlich's experiment (illustrating the changes which take place in a selenite under the influence of heat).

There are but few who would disagree with me in the opinion that the microscopic world, as regards its design and its molecular structure, is quite as wonderful as the great works around us seen with the unaided eye. A magnifying glass of low power opens up a world far larger than that which we are accustomed to see. At the present time, even with the most perfect apparatus that exist, only a small portion of the universe is known to us.

Scientific study should be pursued by all in a greater or less degree. It teaches more important lessons than the most impressive discourse ever preached. During the investigation of what is generally termed the invisible world, men should at times pause to reflect, and ask themselves such questions as these: What is the meaning of, and to what end is, creation? Is it all mere chance? Were such wonderful designs and properties created at the beginning? Was there in matter at the beginning an inherent, or implanted, power of development? Simple as these questions may seem, man in the flesh will never be able to find the true answers. The extraordinary design and structure which have existed in the unseen world for millions of years, or possibly in all past time, and even at the present day known to so few, demonstrate at least that the great Power has bestowed the same care upon what appear to us the most insignificant portions of creation as upon what we think are the greatest works in the universe. These silent sermons must surely influence the mind, and set it thinking of the supernatural and of our duties during life.

It may now with truth be said that science gives us means, such as never before existed, of appreciating the greatness of the Supreme Spirit, by enabling us to read fresh chapters in the book of nature.

#### THE INFLUENCE OF ALCOHOL UPON THE LIVING HUMAN SYSTEM.\*

By N. S. DAVIS, M.D., LL.D., of Chicago.

WE are assembled to note the first anniversary of this association, which was organized in Washington, D. C., May, 1891. The objects had in view by those who participated in its organization, as declared on that occasion, were "to advance the practice of total abstinence in and through the medical profession, and to promote investigation as to the action of alcohol in health and disease; and to form a bond of union among medical abstainers all over our country." That those three objects are of sufficient importance to challenge the attention of every well informed and unbiased member of the profession, must be admitted by all. Especially is this true if we consider the fact that more than \$800,000,000 are annually paid for alcoholic drinks, fermented and distilled, by the people of this country; over \$700,000,000 by the people of Great Britain; and nearly in the same ratio by all the nations occupying the Continent of Europe; and all this without returning so much as a single cent to the consumers who pay the money, or a pound of bread for their families. If we also consider the fact that all our highest judicial authorities and social economists attribute much more than half of all the pauperism and crime, in the same countries, to the use of those drinks, while the highest authorities in our own profession freely admit that a large percentage of the sickness and mortality is traceable to the same source, we shall be compelled to admit that there is no other topic more imperiously demanding the candid, persistent and thorough investigation by every practitioner of the healing art than that which relates to the real influence of alcohol directly upon the living human system and indirectly upon the collateral interests of the race.

To make such investigation accurately and reliable, the investigator must himself be free from the deceptive and perverting influence of the alcohol upon his own brain and blood. In the language of our Code of Ethics: "It is incumbent upon the faculty to be temperate in all things, for the practice of physic requires the unremitting exercise of a clear and vigorous understanding; and in emergencies, for which no professional man should be unprepared, a steady hand, an acute eye, and an unclouded head may be essential to the well being, and even life of a fellow-creature." Hence, our by-laws require the practice of total abstinence from alcoholic drinks by the members of this association, although they place no restrictions upon the conscientious use of alcohol in the treatment of disease. To determine more accurately the origin, nature, physiological effects, and therapeutic uses of alcohol, and to diffuse a knowledge of the same, both in and out of the profession, is the paramount object of our organization. As an association we have nothing to do with the political parties and questions of the day, whether of prohibition, high license, low license, protection, free trade, or reciprocity. Our work is one of strict scientific inquiry and investigation. Professor Schmoller, the economist, of Germany, says: "Among our working people the conditions of domestic life, of education, of prosperity, of progress, or of degradation, are all dependent on the proportion of income which flows down the father's throat. The whole condition of our lower and middle classes, one may even without exaggeration say the future of the nation, depends on this question." As the same may be said with equal truth concerning our own people, it certainly becomes us, as the professional guardians of the public health, to ascertain more certainly the nature and effects of those drinks that "flow down the father's throat," and which carry with them the income on which depends the domestic happiness, the education, the prosperity and much of the health of the whole community. It is hardly necessary to say that the one essential ingredient in all the "drinks," here spoken of, whether fermented or distilled, is alcohol. It is not found as a proximate element in living organized bodies, either vegetable or animal, but is exclusively the product of bacteriological action on glucose or saccharine matter, constituting the process known as vinous fermentation. In other words, the alcohol is an effete toxic product resulting from the action of the micro-organism known as the torula cerevisiæ, of Turpin, on sugar or glucose, and is composed of C<sub>2</sub>H<sub>5</sub>O. It is therefore chemically

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a pure carbo-hydrate, and early in the progress of analytic and organic chemistry, it was unfortunately classed by Baron Liebig with those carbo-hydrates resulting from vegetable growth or nutrition, starch, sugar, gum and cellulose, as supporters of combustion or respiratory food when taken into the human system. Such classification was not founded on the results of any scientific investigations showing that the actual effects of alcohol, starch, sugar, etc., when taken into the living system, were similar, but solely on the fact that they were all composed of the same ultimate elements, carbon, hydrogen, and oxygen, in such proportion as to admit of further oxidation outside of the living body.

And as such oxidation or combustion was accompanied by the evolution of heat, it was assumed, without experiment or proof, that all these carbo-hydrates were oxidated in the living system, and were active supporters of respiration and animal heat, while the various organized animal tissues were developed and nourished from the nitrogenous proximate elements of food. The simplicity of such a classification of foods and animal tissues, aided by the high authority of Liebig, caused it to be universally accepted and thoroughly incorporated into both medical and general literature, where, in the public mind at least, it still remains; and is a fair illustration of the danger or fallacy of assuming that similarity of chemical composition is proof of similarity of action when taken either as drink, food, or medicine.

From a somewhat extended investigation of the subject, I think it may be stated as a general law that all the orders of animal life are dependent for their development, growth, and nutrition upon materials resulting from either vegetable or animal growth. Certainly, none of the higher orders of animal life assimilate and appropriate for the growth or repair of their structures and the support of their physiological processes inorganic materials not previously combined under the formative or vitalizing influence of vegetable or animal life. It may be further stated as an equally general law, that the products of retrograde metabolism or tissue metamorphosis as presented in the excretions and eliminations from living bodies, both vegetable and animal, are not only not capable of being used as food, but are either inert or positively toxic if retained or reintroduced into the living body. Hence we have a clear and most important distinction between such carbo-hydrates as starch, sugar, gum, cellulose and dextrin, resulting from vegetable and animal nutrition, and the alcohols, which result solely from retrograde metamorphosis or bacteriological excretion, usually termed fermentation. And instead of acting alike as respiratory or indirect food, as has been claimed so long, all the strictly scientific investigations of the last half century have proved their action upon the structures and functions of the living body to be as diverse as their origin. Thus the carbo-hydrates of the first class named, starch, sugar, gum, etc., when taken into the healthy stomach, readily undergo such digestive and assimilative or molecular changes that their identity is not recognizable in either the blood or tissues of the healthy animal, and the products derived from them produce no unnatural excitement or disturbance in any of the functions and processes of the living body. Though taken in proper quantities daily from year to year, they create no craving or morbid appetite for more; and when the quantity taken at one time is excessive, such excess is rejected with the ordinary faecal matter of the intestines.

But the alcohols constituting the second class undergo no such digestive or assimilative changes in the stomach or digestive apparatus. If the ordinary ethylic alcohol is taken into the living stomach undiluted and absolutely pure, it acts directly upon the tissues with which it comes in contact as a destructively corrosive poison, and speedily destroys the life of both vegetables and animals when brought in contact with them. When largely diluted with water, as it is in the various fermented and distilled liquors, and taken into the stomach, it is rapidly imbibed, without change, and carried directly into the blood, and with it, into every tissue and organ of the body, as has been demonstrated by the application of reliable tests many hundred times. More or less of it also soon reappears in the excretory secretions and eliminations of the lungs, skin, and kidneys, like other foreign or non-assimilable materials. While retained in the blood and in contact with the tissues, the alcohol modifies in a marked degree the sensibility of the nervous structures, and also the molecular or metabolic changes concerned in nutrition, disintegration, and sensation. If taken daily for a considerable length of time, it invariably creates a morbid appetite or craving for steadily increasing quantities, and sooner or later establishes degenerative changes in nearly all the organized structures of the body. It is obvious, therefore, that there is actually no similarity or analogy, either histological or physiological, between the carbo-hydrates of vegetable and animal growth and those derived from bacteriological or putrefactive fermentation. And the time has fully come when the purely theoretical, and most mischievous error of grouping them together as respiratory and force-generating food should be corrected in all our literature and eradicated from the public mind. Half or three quarters of a century since, when alcohol was placed at the head of the list of respiratory foods by the chemico-physiologists of that day, it was claimed that when taken into the living body it readily combined with oxygen, and was resolved into carbon dioxide and water, with the evolution of heat; and hence it came into almost universal use as a supposed stimulant and promoter of animal heat. Step by step, however, investigations, carefully devised and faithfully executed, have not only demonstrated this supposition to be erroneous, but they have equally demonstrated the real action of alcohol in the living human system to be that of an active anæsthetic, directly diminishing cerebral and nerve sensibility and muscular action; a retarder of the internal respiration, by which oxygen is carried from the pulmonary to the systemic capillaries; and a sedative or retarder of the molecular or metabolic changes in the tissues and secreting structures of the body. These several propositions have been so fully sustained by the direct experimental investigations of Prout, Böcker, myself, Richardson, Anstie, Hammond, Harley, Sidney Ringer, Martin, H. C. Wood, Lauder Brunton, Dubois, Reichert, and many others, that it would be superfluous to quote

them in detail. There are, however, still many, both in and out of the profession, who claim that the alcohol is an anæsthetic only when given in large doses; while if given in smaller doses and repeated at suitable intervals, they claim it acts as a stimulant and tonic, especially on the cardiac nerves. The incorrectness of this claim is completely demonstrated by the investigations of Drs. Ringer and Sainsbury, Professors Martin and H. C. Wood.

The experiments of Sidney Ringer and Harrington Sainsbury were instituted for the purpose of determining the relative strength of different alcohols as indicated by their influence on the action of the heart of the frog. In closing their report on the subject they say: "By their direct action on the cardiac tissues these drugs (alcohols) are clearly *paralyzant*, and that this appears to be the case from the outset, no stage of increased force of contraction preceding."

The experiments of Professor Martin, of Johns Hopkins University, were performed on the dog, and he states the results obtained as follows: Blood containing  $\frac{1}{2}$  per cent. by volume of absolute alcohol has no immediate action on the isolated heart. Blood containing  $\frac{1}{4}$  per cent. by volume, that is,  $2\frac{1}{2}$  parts per 1,000 of absolute alcohol, almost invariably remarkably diminishes, within a minute, the work done by the heart; blood containing  $\frac{1}{8}$  per cent. always diminishes it, and may even bring the amount pumped out by the left ventricle to so small a quantity that it is not sufficient to supply the coronary arteries."

Professor H. C. Wood, of the University of Pennsylvania, also executed his experiments on the dog, and in his address to the International Medical Congress at Berlin, 1890, states his results as follows: "An 80 per cent. fluid (alcohol) was used, diluted with water. The amount injected into the jugular vein varied in the different experiments from 5 to 20 cubic centimeters, and in no case have I been able to detect any increase in the size of the pulse, or in the arterial pressure, produced by alcohol, when the heart was failing during advanced chloroform anæsthesia. On the other hand, on several occasions the larger amounts of alcohol apparently greatly increased the rapidity of the fall of the arterial pressure, and aided materially in extinguishing the pulse rate." That alcohol exerted, not only a general anæsthetic effect upon the nervous system, but also a special or direct paralyzing influence on the cardiac and vaso-motor nerves, strictly parallel with that produced by chloroform and ether, was clearly shown by R. Dubois in 1883. And the editor of the department of experimental therapeutics in the fifth volume of the *Annual of Universal Medical Sciences*, 1892, in referring to the review of the work done by nearly all those who have engaged in experimental investigations regarding the effects of alcohol on the living system, by E. MacDowell Cosgrove, truly says: "Contrary to what has been and is supposed, it is found from all these researches that small doses of alcohol, from the first, produce a narcotic rather than a stimulating effect." And he adds that all the observers except one had "also found that alcohol in small doses diminished the amount of carbon dioxide exhaled." It is thus shown, by the direct experimental researches of the most eminent men in different countries, aided by all the instruments of precision invented in this period of active scientific progress, that alcohol in the living system actually diminishes the sensibility and action of nerve structures in direct proportion to the quantity used. An ordinary regard for scientific accuracy, therefore, demands that it should be classed as an anæsthetic or narcotic, and in no sense as a stimulant or tonic. In studying further the mode by which alcohol produces its effects while in the living human system, it is necessary to appreciate the full import of the following propositions:

1. All nerve sensibility and force, and all natural molecular or metabolic changes, nutritive, secretory, and disintegrating, taking place in the living tissues, are absolutely dependent on the presence and movement of blood containing its natural proportion of oxygen.

2. The oxygen needed in the blood is received from the pulmonary air cells by the hemoglobin and serum of the blood, and in them conveyed to the systemic capillaries, where it comes in contact with, and exerts its influence on, every cell and structure of the body.

3. Alcohol at ordinary temperatures of the air, or even of that of the living human body, manifests but a very feeble affinity for oxygen, but does manifest a very strong affinity for water, albumen, and hemoglobin, acting upon them readily at all ordinary temperatures.

If, therefore, alcohol, sufficiently diluted to permit its circulation in the blood, should be introduced, either by the stomach or any other method, instead of uniting with the oxygen, it presents its superior affinity for the hemoglobin and serum albumen, and thereby directly interferes with their reception of more oxygen from the pulmonary air cells. It is thus that the presence of the alcohol hinders the hemoglobin from being converted into oxy-hemoglobin in the pulmonary capillaries, and in the same ratio diminishes the amount of oxygen conveyed to the systemic capillaries; and in the same ratio, also, the nerve sensibility and metabolic changes diminish. This affords a full explanation of the facts now admitted by all who have carefully studied the subject, namely, that the presence of the alcohol retards both nutritive and disintegrative changes, diminishes excretory products and temperature, and lessens nerve sensibility and force.

An explanation of these admitted facts has been hitherto, and still is, sought for on the supposition that the alcohol simply unites with oxygen of the blood, and thereby prevents or diminishes the action of the latter on the tissue elements of the body, and yet generates heat and some kind of force. The fatal defect in this old combustion or oxidation theory is, that no investigator has been able to find the legitimate products of such oxidation. So far as is known, the oxidation of alcohol resolves it into either aldehyde, carbon-dioxide and water, or acetic acid, and evolution of heat. Consequently, if alcohol underwent oxidation in the system, some increase of one or all of these products should have been uniformly found, either in the blood, the exhaled air, or in the other excretions. But instead, the most accurate and nu-

merous investigations show less carbon-dioxide in the exhaled air, less temperature of the body, and neither acetic acid nor aldehyde in the blood.

And yet the puzzled investigators turn and say that, inasmuch as the alcohol disappears in the system and cannot be all regained from the secretions and eliminations in a limited time, it *must* have been oxidized, and converted into some kind of force. But what force? Certainly not nerve force, mental force, muscular force, heat force, or metabolic force; for all of these are directly diminished by its presence. The only force found operative in the case is the superior affinity of the alcohol for the hemoglobin, albumen, and water of the blood; and its toxic power to so modify their molecular condition and properties as to diminish their efficiency in receiving and conveying the oxygen from the pulmonary to the systemic capillaries, and thereby impairing all the vital processes in which the presence of oxygen is required.

This view enables us to see the philosophy or *rationalité* of those illusions and delusions that have been imposed upon the human mind by the use of alcohol in both health and disease through all the generations of the past. Thus a moderate dose in health, by its anæsthetic effect on the nerve cells of the brain, lessens the individual's consciousness of cold or heat, of weariness or despondency or weakness, and he is deluded with the idea that it had warmed and cheered and strengthened him, when it had done neither; but instead, had simply diminished the acuteness of his own perceptions while the evils continued in full force. So in the progress of disease, its use generally has the same anæsthetic effect, causing the patient to complain less, rest more, and often say he feels better; but it neither removes the exciting cause, nor corrects the morbid processes constituting the disease, nor increases the activity of the metabolic changes of either nutrition or elimination. Nor is this all. For in the same proportion as the alcohol diminishes the internal distribution of oxygen, and thereby acts as a so-called conservator of tissue, it still more actively interferes with the katabolic processes by which the natural excretions are maintained and foreign disturbing elements are eliminated, and consequently it prolongs the morbid processes, favors molecular degenerations, and increases the ratio of mortality. Clinical facts and cases could be cited in abundance, illustrating and sustaining the correctness of the foregoing views, did my time permit. I will, however, at present only add for your consideration the following questions:

1. If the physiological standard of health requires a natural degree of sensibility of the cerebral hemispheres and the internal distribution of oxygen in natural quantity, and the presence of alcohol diminishes both in direct ratio to the quantity taken, how is it possible for persons in health to use it without injury?

2. If the alcohol, while in the living system, does thus diminish the sensibility of the nerve structures and retard the internal distribution of oxygen, is it not a true anæsthetic and organic sedative, and, therefore, adapted to the treatment of only a very limited number of morbid conditions presented in the progress of disease?

3. Is it not true that all the fermented and distilled alcoholic liquors are genuine toxic products of bacteriological cultures, and ought we not to uniformly designate them as such, instead of continuing to delude ourselves, our patients, and the public generally by calling them tonics, stimulants, or indirect food?

#### NITRATED SILK.\*

By L. VIGNON and P. SISLEY.

WHEN silk is immersed in ordinary nitric acid (sp. gr. 1.133) at 45° for one minute, and is subsequently washed in water, it is colored intensely yellow, and the color is unaffected by exposure to air and light, while it is deepened by the action of dilute alkali solutions. Nitric acid free from nitrous compounds does not cause this coloration, which is found to vary in intensity directly with the amount of nitrous compounds present, and with the temperature and specific gravity of the acid used. The deepening of color by alkaline solutions is independent of their causticity, while the silk increases in weight and takes up a certain amount of the base.

Silk treated with a mixture of hydrochloric acid and sodium nitrate is colored pale yellow; the color is rapidly browned on exposure to air and light, or by the action of boiling water or alcohol, while cold alkaline solutions turn it reddish brown. Silk which has been subjected to the action of nitrous acid, or of nitric oxide, in an atmosphere of carbonic anhydride, and subsequently well washed, is colorless, but is colored a stable yellow by nitric acid. Nitric peroxide colors silk yellow at once. Silk heated with nitrous acid, and then oxidized with potassium permanganate and hydrochloric acid, is colored exactly as by nitric acid (impure), from which it seems that the yellow coloration is dependent on the action of nitrous compounds, and subsequently of an oxidizing agent.

The yellow color is discharged by acidified stannous and chromous chloride solutions. Analyses of the nitrated silk show that about 2 per cent. of nitrogen is fixed in the reaction, probably, primarily, as the nitroso group, which the further action of the nitric acid converts into the nitro group, a carboxyl group being displaced. The properties of the product somewhat resemble Mulder's xanthoproteic acid, but this contains more carbon and less nitrogen, and results from a more intense action. Sulphuric acid dissolves ordinary silk gradually to a slightly colored solution, whereas nitrated silk is converted into a pale yellow viscid mass. Aqueous potash dissolves ordinary silk in the cold, and nitrated silk on heating; neither solution is precipitated by dilution with water, and both evolve ammonia when heated. Both varieties of silk are dissolved by hydrochloric acid and by zinc chloride solution.

Ammoniacal vapors are evolved on distillation of each variety, and a carbonaceous residue is left. On ignition, nitrated silk burns more rapidly than ordinary silk.—*Am. Jour. Phar.*

\* *Bull. Soc. Chim.* [3], 6, 898; *Jour. Chem. Soc.*, September, 1892, p. 1111.

[Continued from SUPPLEMENT, No. 884, page 14134.]

#### OLEOMARGARIN.\*

By Prof. G. C. CALDWELL, Cornell University, Ithaca, N. Y.

BEYOND what I have given you in what has gone before, I find nothing more in the literature of this subject for the past twenty years that relates to the question of the danger to health in the use of oleomargarin, except numerous statements by scientific men of eminence in this and other countries. Morton, President of Stevens Institute; Chandler, of Columbia College, for so many years president of the New York City Board of Health; Johnson and Brewer, of Yale, both well known by farmers throughout the country for the good work they have done in behalf of agriculture; Goessman, now and for many years past director of the Massachusetts Agricultural Experiment Station; Atwater, of Connecticut, so well known for his writings on food products; Armsby, director of the Pennsylvania Experiment Station; Alvord, most prominently identified with the interests of farmers for many years, and now director of the Maryland Experiment Station, all have spoken or written in favor of oleomargarin as a food product. It has required the courage of their convictions for many of these men to utter their opinions; and they have in many cases had only the comfort of a clear conscience to offset the abuse of the agricultural press that has been heaped upon them. Abroad, I would mention particularly Lyon Playfair, one of the most distinguished chemists and sanitary authorities of England. In his place as member of Parliament, he spoke in a very different strain from that indulged in by some of our Congressmen, when he said: "As to the relative wholesomeness of oleomargarin and butter, I do not think there is anything to choose between them. Certainly rancid oleomargarin is a nasty and unwholesome compound; but not any more so than nasty and rancid butter, which abounds in so many markets. Both are unfit for human food, although both may be purified by well known processes." I would like to quote more from this admirable speech, but lack of time forbids.

Finally, allow me to call your attention to the remarkable absence of any reference to this food product by the most active and efficient State boards of health in this country. If there were such terrible dangers lurking in oleomargarin as has been so many times asserted, surely these boards of health have seriously failed in the discharge of their duty in giving so little attention as they have to the matter. A careful examination of the files of such reports as are in our university library fails to disclose any allusions of any importance whatever to the subject. Some of these States have prohibitory laws, and their reports extend back from five to fifteen years.

The whole question of the wholesomeness of oleomargarin as food is summed up in my own mind about in this wise: When properly made from fresh and clean materials it differs but slightly in healthfulness from butter; and this difference is only on account of its somewhat less easy digestibility; that dyspepsia, which has been attributed to it, is likely to be due to a far greater extent to other causes than this, even among those who, because of its cheapness as compared with butter, would be likely to use it largely; that it is possible that it may be made from such unsuitable materials that it will contain germs of disease, and that disease might thus be communicated to man; but that there is no positive proof that it is now made of such materials, or ever has been, or that any disease has ever been communicated to man by its use; but that the possibility exists, all the same, and the only way to make it of no effect is by careful inspection of the process of manufacture by capable officials.

To my statement that probably no other food product has been so much discussed with reference to its wholesomeness, I may also add that none has been so much specially legislated upon as this. Let us consider what is the present condition of this legislation.

New York being a great dairy State, and also, in the beginning, the great center of the manufacture of oleomargarin, was naturally one of the States in which special legislation began earliest. Two enactments in 1882 prohibited, (1) the coloring of the product to make it resemble butter, or the sale of any such colored product; and (2) required that all packages containing any such imitation of butter or cheese be plainly labeled. In 1884 the manufacture and sale of such imitation were forbidden in a special section of a general dairy law. This was pronounced unconstitutional by the Court of Appeals; but another slightly different enactment in the following year was allowed to stand.

The constitutionality of this final enactment was decided on this ground: that when a product of manufacture is turned out so closely resembling some other product of which the manufacture is already established as not to be distinguishable from it by the senses, and is made for sale in the place of that substance, it is constitutional to prohibit the manufacture and sale of it. But if it is turned out in some different form, as, for instance, uncolored, then its manufacture and sale cannot be prohibited, except on plain grounds of injury to the health of the community.

At the close of 1885, Maine, Michigan, Minnesota, Missouri, New Jersey, Pennsylvania, and Wisconsin, besides New York, had laws prohibiting the manufacture and sale of oleomargarin or any kind of artificial butter made from other fats; and New Hampshire had a law that was practically prohibitory, requiring that all such imitation of butter should be colored pink. California, Colorado, Connecticut, Delaware, Ohio, Oregon, Rhode Island, Tennessee, Vermont and West Virginia had simply regulative laws, providing that the substance shall be sold under its own name.

At the close of the year ending June 30, 1891, Maryland had been added to the list of prohibitory States, and Minnesota, Vermont, and West Virginia had joined company with New Hampshire in requiring the pink coloration of the artificial butter, while New Jersey, Massachusetts, and Ohio prohibited the sale of it only if colored in imitation of butter. Of the other States, Arkansas, Kentucky, North Carolina, Tennes-

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