the required amount of coloring pigment. These varnishes are made by melting gum copal for best varnishes, or kauri or resin for cheaper qualities. The melted resin is then dissolved in hot linseed oil, and to the mixture is added sufficient turpentine to thin it down to the required consistency. The varnish so made is then ready for use. For fuller details reference should be made to one of the various works which deal with varnish making, such as Hurst's Painters' Colors, Oils, and Varnishes. Opaque pigments should be used in this class of enamel paints. The aniline or coal tar colors, owing to their insolubility in oil and turpentine, are not very suitable for coloring oil varnishes, and their use is best avoided. These slow-drying enamel paints take from 12 to 24 hours to dry, according to the varnish used. They leave a good, firm lustrous coat, which, in the majority of cases, is more durable than that which can be obtained from a quick-drying enamel paint. They are, however, not so generally useful; as a quick-drying paint is, on the whole, much more serviceable for use by the public, who often desire to handle objects almost as soon as they are painted.

THE CARE OF THE SKIN.*

By JAMES C. MCGUIRE, A.M., M.D., of Washington, D. C., formerly lecturer on Dermatology at the Hospital School of Medicine, Louisville, Ky.; Dermatologist, Louisville City Hospital, etc.

THAT we may better appreciate the importance of the proper care of the skin, it is well to know something of this, one of the most important and complex organs of the body.

It is practically divided into two parts—the outer, cuticle, scarf-skin or epidermis and the deeper true skin or corium.

The epidermis is subdivided into the corneous layer, composed of flat, lifeless, colorless cells and the malpighian layer (so named from the anatomist, Malpighi) of irregular shaped cells, developing to replace those of the outer layer that have been cast off. It is these cells that contain the coloring matter that causes the difference in hue in the European and African. The true skin or corium (from the Latin *corium*, leather) is divided into the outer papillary layer, made up of little elevations called papillæ, intended to give a greater amount of surface. It has been computed that there are about one hundred and fifty millions of these over the whole body. Below this is the reticulated layer (from the Latin *reticulatus*, net-like or latticed), made up of elastic interlacing fibers, the meshes of which become larger and larger, until we reach the subcutaneous tissue which connects the skin to the parts beneath.

The corium is well supplied with blood vessels, lymphatics, nerves, glands and hairs. The arteries from below send off little capillary loops, which ascend in the papillæ, then descend to become veins; they are called capillaries (from the Latin word *capillaris*, like a hair), they are so small and slender. Some of the nerves send off prolongations that become lost in the deeper cells of the epidermis. Others enter the papillæ to wind around and penetrate little bodies called tactile corpuscles. There are two varieties of glands—the sudoriparous and sebaceous. The former derives its name from two Latin words, *sudor*, sweat, and *pario*, I produce. They are made of tubes twisted in the form of a coil in the lower part of the corium, with a duct, ascending through the entire thickness of the skin, to open upon its surface. They are most numerous upon the palms of the hands, where there are about two thousand seven hundred to the square inch, or about two million three hundred and eight thousand over the whole body—an entire length of secreting tubes of two and one-third miles.

The sebaceous glands are made up of a mass of lobules, with a tube that usually enters a hair follicle. The hairs are regarded as modified epidermis. Almost the entire skin is provided with these appendages, except the palms, soles and some other parts. They receive their nourishment and growth from the hair papillæ, which they surround in the corium; occasionally they spring from the sides of the hair follicle; the total number in an average head of hair is said to be one hundred and twenty thousand. They are elastic, stretching about one-third their length, about one-fourth of an inch thick, and will support a weight of two and a half ounces.

Sir Erasmus Wilson has reported the case of a young woman in whom the hairs covered almost the entire surface of the body and were thick enough to conceal the skin. Cases are reported in which the beard grew to the length of seven or eight feet. The hairs of the beard grow at the rate of about six inches in one year.

As to blanching of the hair in the course of a few hours, there are but few well-authenticated cases. In one mentioned in Flint's *Physiology*, the hairs turned white in the course of the night in a patient under observation in a hospital. The blanching is caused by the accumulation of air in the medulla and cortex of the hair. There is no diminution in the amount of pigment.

The nails, like the hairs, are derived from the epidermis. They are embedded in the skin at their lateral and posterior margins. The part under the nail is called the matrix, from which it grows. The semi-lunar shaped portion, near the root, is called the lunula. It is paler than other portions of the nail on account of having fewer blood vessels. Erasmus Wilson refers to a few "golden rules for the care of the nails. They should not be cleaned with any instrument whatever except soap and the nail brush, with an occasional use of the knife or scissors to the free end and an ivory presser to the scarf-skin at the root; when they are stained or discolored a little lemon juice is the best corrective."

So much for the anatomy of the skin. It is usually regarded simply as a covering for the parts beneath and to give shape to the form; but, as has been seen, it has functions peculiar to itself. It is an organ of sensation, especially of touch. This sense can be cultivated to a wonderful degree. We may see this exemplified in the blind asylums, where the inmates are taught not only to read but to study geography, botany, and anatomy by means of models through this sense alone. It has been related of a blind sculptor

that he could model the most perfect likeness simply by touching the face, and of others who could even tell the color of objects in the same way.

The subject of *cutaneous absorption* is of interest, not only as a physiological fact, but from a therapeutical standpoint. A substance that has been applied to the skin and is capable of being absorbed is taken up by the orifices of the glands and follicles and between the cells of the epidermis. According to Prof. Liebrich, corrosive sublimate salve, one to one thousand, made up with lanolin, if rubbed into the skin, is so rapidly absorbed that the characteristic metallic taste, due to the absorption of the mercury, will be noticed in a short time.

As an organ of secretion, sweat is constantly poured out in the form of insensible perspiration—in amount, about two pints or pounds in twenty-four hours. It has a saline taste and alkaline reaction. Composed almost entirely of water, it regulates the temperature to a great extent by the amount that is secreted. In the functional disorder of the sweat glands known as *bromidrosis*, it has an offensive, disgusting odor that will render a patient not only a burden to himself, but repugnant to every one with whom he comes in contact. It is said of Henry IV., of England, who suffered from this affection, that the ladies of his court would faint from the offensive odor when in his presence. Prof. Hammond relates the case of a woman who exhaled the odor of violets during an attack of hysteria. In another functional disorder of the glands, known as *chromidrosis*, it may be colored black, blue or red, or it may become phosphorescent; the body then becomes luminous in the dark.

The secretion from the sebaceous glands, known as sebum, is a semi-fluid substance containing 50 per cent. of fatty matter, and is intended to give softness to the skin. The so-called "flesh worms," or "grubs," are really masses of sebum which clog up the follicles; the little black heads are caused by an accumulation of dirt and pigment.

Considering the important functions the skin has to perform and the harm that will result from the non-performance of these functions, the importance of its proper care can hardly be overestimated. It is true that "beauty usually produces love, but cleanliness will preserve it." Cleanliness is absolutely essential to the correct performance of the functions of the skin and the preservation of the general health; the dust, secretions and the cast-off epithelial scales must be removed by frequent washing. This brings us to the subject of *baths and soaps*. The ancients indulged more freely in the bath than is the custom with us; the Romans, especially, fully appreciated the pleasures and necessity of the bath, and indulged in it to excess. They erected magnificent buildings, supplied with all the requisites for hot, cold and vapor baths; from the ruins as we now see them, we can form but an inadequate idea of their splendor; buildings, including libraries, gymnasiums and baths, were free to the public. Women have endeavored to beautify their skin by bathing in milk and scented waters. To such an extent was this carried in Paris at one time that there was great scarcity of milk for the table. I know of a well-known prima donna who uses a quart of cologne in each bath.

I do not consider the daily application of the full-length bath for hygienic purposes necessary. Twice a week is sufficient to cleanse the skin of all external debris; more frequently than this is simply a luxury. The average Englishman would rather part with his tooth brush than his tub; his solicitous care of it is amusing; it must always be with his luggage; he will bring it across the Atlantic; will take it to the wilds of Africa or to the plains. Why can he go to any place where he cannot procure a better bath than his "tub" can afford? but—"well, you know, it is so English." While traveling on the Northern Pacific Railroad, Montana Territory, some years ago, I heard an Englishman ask the baggage master for his tub, that he might indulge in a bath while the train waited half an hour for dinner. When it was refused him, he simply abused the blasted country, went to a neighboring hotel and took his plunge in the public bath tub. As the train moved off he ran after it, completing his toilet as he ran. He was either a very cleanly person or an extremely dirty one.

Not only is the daily full length bath unnecessary; it is harmful in many cases, depriving the skin of its natural unction, rendering it rough and liable to take on an eczema in those who are predisposed to this disease. The Turkish bath has done as much harm as good; it is of benefit, however, in some cases to stimulate the skin and thoroughly remove all external debris; in this respect it cannot be surpassed.

The hands, face and neck should be washed at least twice a day, and such confined portions of the skin as the armpits, once; the whole body twice a week, as I have already said, is all that is necessary. It should be known that there are certain diseases of the skin, such as eczema, to which water is absolutely poisonous; cases of this disease may at times be cured by simply protecting the part, and not allowing water to come in contact with it. After a cold bath use brisk friction, with a towel, not only to further cleanse the skin, but to excite the cutaneous circulation, and so draw the over supply of blood from the internal organs. Those suffering with heart troubles should abstain from the hot bath, as the heat will cause a determination of blood to the surface and so deprive the heart of its natural supply.

Soap may be defined as the product of the action of alkalies upon refined oils or fats. If the alkali is soda, the result will be hard soap; if potash, it will be soft. Soaps are of three kinds: Alkaline, when there is an excess of alkali, rendering it more or less caustic; neutral, when the alkali and fat are supposed to be exactly balanced; and the over-fatty. Their efficacy depends upon their power of rendering the natural unguent of the skin and debris soluble in water. The soap is decomposed and gives up part of its alkali, which unites with and removes this debris from the skin; the rest of the alkali dissolves the particles of epidermis that have performed their functions and are ready to be cast off. Only the best soap should be used for the toilet—that is, those that are unscented and transparent, for the foreign admixtures may irritate a sensitive skin; they should not contain an excess of alkali, and the fat should be pure and sweet. Probably the best is either the white castile, made

with the best olive oil and soda, or Pears' unscented transparent soap. As to medicated soaps, they are, as a rule, valueless, for the quantity of the drug taken up is very small; it is in contact with the skin too short a time; the amount cannot be measured or its purity guaranteed. They should never be used without the advice of a physician.

There is a popular error that soap should not be used upon the face. There is no good reason for this belief; in fact, it is more important on the face than elsewhere; not only is the face the most exposed portion of the body, but there is a greater amount of secretion here than elsewhere to catch the dust.

It has been said that country girls wash their faces with soap, and do not have acne; city girls abstain from the use of soap, and do. Though this is exaggerated, I have met with cases that have been aggravated by neglect of this part of the toilet.

There is an old saying, "Women who paint their faces to seem beautiful do clearly deface the image of their Creator;" and yet they will frequently resort to any means that hold out the least hope of improving their complexions, such as plastering their faces with paste, enameling, binding it in raw beef, and even wearing medicated masks. The purpose of most of these applications is simply to conceal repulsive blemishes, which in the majority of cases could be readily removed by appropriate treatment. Such methods can only do harm; for if they do not directly injure the skin, they make it tender and much more apt to be affected by external agencies. To make their hands white and bloodless women have been known to spend the night with them suspended by means of pulleys.

I am frequently asked, are dusting powders harmful? Most of them are, for they are liable to contain lead, bismuth or other deleterious ingredients. Plain starch, magnesia or corn starch farina are the least harmful. I advise against the use of any of them, as they will clog up the openings of the glands, and so are apt to prevent them from performing their proper functions. If the face is abnormally greasy, a little sulphate zinc, in water and alcohol as a lotion, will be found of benefit.

Hair Dyes.—As a rule these dyes will not act injuriously, except when they come in contact with the scalp itself, when they may cause some irritation. Black color may be produced by painting in a solution of nitrate of silver, and then exposing the hairs to the sunlight; to avoid staining the surrounding skin it may be washed with a solution of common salt. Prof. Kaposi mentions a hair dye that has been in use very generally in the East, among the Persians. It will produce all shades of color, from a light brown to dark black. "The remedy consists of the powder of the dried henna plant and of the powdered indigo plant. The first powder is formed into a thick paste by means of water, and spread on the hair; after the lapse of an hour this appears of a red color. A paste prepared from the powdered indigo plant is then spread on the first. Under the influence of warmth and moisture the black color becomes apparent on the hairs, covered with these two pastes, in the course of several hours. We have seen, even in the experienced hands of Dr. Pollak, a color produced which was some degrees removed from what was desired." Before beginning the use of hair dyes, read the experience of Tittlebat Titmouse, in Warren's "Ten Thousand a Year."

Hair Restorers.—The Massachusetts State Board of Health has had a large number of so-called hair restorers now in the market analyzed. It was found that all that were examined contained lead in varying quantities. For *falling of the hair*, our chief reliance must be in the use of local stimulating applications. Equal parts of tincture of cantharides and bay rum is an excellent application; it will not blister the scalp. The confidence with which a bald-headed man will use a hair restorer, recommended by a bald-headed barber, has been referred to as a sublime example of faith cure. It is of especial importance that the hygiene of the hair should be looked after—that is, the proper use of the shampoo, brushing, exposure to air and light, cutting and shaving, and in the use of pomades. *Shampooing* should be resorted to about once a month. The best shampoo is made of equal parts of saponis viridis and bay rum; it should be about the consistency and color of sherry wine. As it is frequently made up in the shops, it is a dark thick fluid, caused by the use of an inferior quality of soap. The mistake should not be made of applying the shampoo to the hairs alone, but the hairs should be separated and the liquid dropped upon the scalp, here and there, and then with the use of a little water rubbed thoroughly for five or ten minutes. Usually the shampoo is not applied with sufficient vigor. The hair should be dried and an ointment, such as sulphur, one drachm to the ounce, applied. As to *brushing*, a good stiff brush should be chosen, such as recommended by Dr. Jackson. "A properly made brush has its bristles placed in little clumps or groups in such a manner that the little bristles of each group are larger than those of the periphery. The bristles are well set into the back of the brush and the groups are wide apart." With such a brush the hair can hardly be brushed too much. Not only should the fine tooth comb be interdicted, but any form of comb is bad for the scalp; it is not necessary, as the part can be just as well made by means of two brushes. Wigs and false hair heat and sweat the scalp, and deprive the hairs of the sunlight and air which are necessary to their healthy growth.

Hirsuties.—Women suffering from an abnormal amount of hair will resort to any means to get rid of this blemish. They usually shave or extract the hairs, but this only acts as a stimulant to renewed growth. So-called depilatories are worse than useless; they contain ingredients that have the power of dissolving the hair; but, if we remember the anatomy of the skin, it is evident that it is impossible for them to reach the papillæ, from which the hair receives its nourishment, without destroying the whole thickness of the skin. The only means by which the hairs can be permanently removed is the method resorted to by dermatologists, known as electrolysis. A fine needle is inserted into the hair follicle down to the papillæ, which is destroyed by the passage of an electric current from the negative pole of a galvanic

* From the *Virginia Medical Monthly*.

battery. Five thousand hairs have been removed from a lady's face by this means, resulting in permanent relief of the trouble.

Lotions for the toilet, as found in the shops, are liable to contain mercury. This may be absorbed and produce symptoms of constitutional poisoning. What is known as "flake white" is made by mixing carbonate of lead with rose water. Cases are not infrequently reported of women, who have been poisoned, showing symptoms of the constitutional effects of the lead. Some of the symptoms are delirium, abdominal pain, a peculiar drop of the wrist, and a characteristic blue line along the edge of the gums.

Some Popular Errors in regard to Skin Diseases.—Though many of our colleges completely ignore the study of dermatology, the leading universities have awakened to the fact that it is a subject not to be neglected, and examinations are now even made compulsory. It is just as important to make a correct diagnosis between an eczema and psoriasis as it is between scarlet fever and measles, variola and varicella. It is presumable that the study of cutaneous diseases is neglected to such an extent on account of their unimportance; but in refutation of this, one has only to refer to the literature of the subject; to such books as Hebra's *Diseases of Skin*, in five volumes, of three or four hundred pages each; to recall such names as Hebra, Kaposi, Neuman, of Vienna; Sir Erasmus Wilson, Tilbury Fox and Addison, of England; Bulkley, G. H. Fox, Morrow, Piffard, White, Hyde, and a host of others in this country—men who have devoted their life study to this subject, and who have no superiors in any branch of the medical profession.

Familiar appellations for skin diseases are not confined to the laity. The most diverse, ridiculous and unmeaning terms have been applied to these affections, such as *tetter*, that usually refers to eczema, or may mean psoriasis or lupus. *Bakers' itch*, *grocers' itch*, *milk crust*, *tooth rash*, are also used to designate some form of eczema.

Liver spots may refer to chloasma, a pigmentary affection, or to tinea versicolor, a vegetable parasitic disease.

The itch, to scabies, a disease caused by an animal parasite, known as the *acarus scabiei*. The expression, *army itch*, would lead one to suppose that it was distinct from scabies, yet we recognize it as the same disease.

Blood boil has no scientific meaning and is applied to various diseases.

Hives is recognized by some as urticaria; by others as varicella (chicken pox).

Shingles means herpes zoster, an acute disease, characterized by an eruption of groups of vesicles upon an inflamed base along the course of certain nerves.

Prickly heat usually refers to a disease known as miliaria, an affection of the sweat glands.

Dandruff, to the dry form of seborrhoea of the scalp.

Black heads (flesh-worms), to comedo, a collection of sebaceous matter in the distended sebaceous glands. The little black heads are caused by the accumulation of dust and pigment.

Ringworm is a vegetable parasitic disease, caused by the trichophyton fungus, and is known as trichophytosis.

Barbers' itch is caused by this same fungus upon the bearded portion of the face, and is designated by the term tinea sycosis.

Fish skin disease is a congenital affection characterized by dryness and scaling of the skin. Its proper name is ichthyosis.

Chap is usually a mild form of eczema, attended with cracking of the skin.

As to the etiology of skin diseases, how often we hear the expression, *bad blood*. Has this term any meaning? If it has, it must mean a depraved state of the blood that can be recognized by chemical reagents or by the microscope; but Prof. Bulkley says "Chemical and microscopical studies fail to show there is bad blood in any of the diseases of the skin. It is supposed the impurities in the *bad blood* find exit through the skin, and in so doing take the form of an eruption; consequently it is harmful to remove them. Patients frequently express themselves as very solicitous about the sudden cure of a skin disease. The consequence, in their opinion, might be disastrous by the driving in of a disease that might attack some internal organ. Nothing could be more absurd, for it is absolutely impossible, in this sense, to either drive in or drive out a skin disease. The blood has little to do with these diseases. There are affections as peculiar to this organ as to any other, entirely localized, depending upon changes in the tissues themselves. Others are caused by parasites; still others by nervous disturbances. It is evident that the much lauded *blood purifiers*, for cutaneous diseases, are, to say the least, useless. A patient may get well while taking these quack nostrums; the fact is then extensively advertised. This is about on a par with the announcement of lottery companies of the fortunate individuals who have obtained prizes. The tens of thousands who are not so fortunate are never heard from."

The majority of skin diseases are regarded as contagious, and the fear is expressed that those who come in contact with the afflicted are liable to become affected; but this is far from the truth, for out of the hundred and more diseases that may affect this organ, only two or three, besides the parasitic diseases, are really contagious.

As there are so many popular errors in regard to cutaneous diseases, the following *aphorisms* may be of some interest. The statements are made either upon the evidence of well recognized authorities or as a result of my personal experiences:

I. You cannot be successful in treating diseases of the skin without a thorough knowledge of general medicine. This, I think, will be accepted as a self-evident proposition.

II. You cannot cure them too quickly.

III. If they are cured, they will not act deleteriously upon any internal organ. Hebra says: "Our warmest endeavors are to find means of terminating these diseases as speedily as possible. Were we only in possession of remedies which produce cures thus rapidly we should have no anxiety in regard to the appearance, from this cause, of metastasis, or of any other consecutive disease."

IV. Arsenic is not a specific for cutaneous diseases;

in fact, it is less frequently used by those who have made a special study of these diseases than by the general profession.

V. You cannot drive in or drive out diseases of the skin. "At this day no educated physician believes in employing medicine with a view to either the so called 'driving out' or 'driving in' of a disease of the skin."—Hyde.

VI. The great majority of these diseases, contrary to the general idea, are not contagious; only one or two, besides the parasitic diseases, out of the hundred and more that may attack this organ.

VII. Freckles are not always produced by the sun's rays. Cases are reported where they have appeared upon the portions of the body of young girls that have never been exposed to the direct rays of the sun.

VIII. Tinea tonsurans (ringworm of the scalp) does not occur in adults, though Tilbury Fox has reported one such case. If it ever occurs, it is extremely rare. Neither Duhring nor Piffard ever met with a case.

IX. Tinea versicolor, another parasitic disease, does not occur in childhood. "Children are exempt."—Weyl and Gaber. Neither Duhring nor Liveing ever saw a case.

X. Acne does not occur in childhood. Mild cases of this disease are not the easiest to cure.

XI. Chloasma (liver spots) never occurs before puberty. The disease is not caused by diseases of the liver.

XII. Bromidrosis does not necessarily mean bad-smelling sweat. The odor may be that of violets or pineapples.

XIII. Scabies and tinea versicolor do not appear upon the face of adults.

XIV. Eczema marginatum is not an eczema, but is a parasitic disease.

XV. Leprosy, as we now understand the disease, is not described in the Bible. Leprosy is not as dangerous to the community as tuberculosis, according to Beaven Rake, Superintendent of the Trinidad Leper Asylum. It is not proved that the disease has been conveyed by vaccination.

XVI. You cannot cure an eczema (tetter) by internal treatment alone. Hyde says, once fully persuaded of this important truth, the physician should be capable of managing the complaint without mental bias.

XVII. Do not apply water to an eczematous surface, as a rule. It is poisonous to acute eruptions.

XVIII. Do not expect the same effect in different persons from the same prescription; that which is of benefit in one case may aggravate an eruption in another.

XIX. Do not use a sponge in making applications to the skin. It cannot be kept clean and pure.

XX. Depilatory remedies cannot permanently remove the hairs without scarring the skin.

XXI. Pruritus does not simply mean itching as a symptom; it may refer to an idiopathic disease that is known by that name.

XXII. Bad blood is not the chief cause of cutaneous diseases; according to most authorities, it can hardly be classed as an etiological factor.

XXIII. Scales and crusts are not synonymous terms.

XXIV. Drug eruptions are not due to "salivation of the system" with the drug. A few grains of iodide of potassium may cause an eruption as well as a hundred.

Idiosyncrasy has been defined as an individual peculiarity which renders one susceptible to certain effects not produced in others. In this way, every one is susceptible to certain ill effects from certain foods; therefore those things which your stomach has taught you it will not digest should be avoided. Shell fish, strawberries, oatmeal, etc., have been known to produce urticaria. Confectionery may aggravate an acne or an eczema. It is well to remember to keep the teeth in good condition; to have regular hours in partaking of food; not to eat to excess; never to dine alone; to eat slowly and chew thoroughly. Though it is impossible to lay down any fixed precepts of diet, there are certain articles that should be avoided by those suffering with cutaneous diseases.

PERMITTED.	TO BE AVOIDED.
Water plentifully between meals; cup of very hot water before breakfast; small amount bottled table water at meals; one cup of coffee or tea, well diluted, for breakfast; milk and <i>Wibbum</i> if it agrees.	Stimulants, especially fermented liquors; all beer, wine, cider, etc.; all fried articles; salted meats, pork, veal, lobster, cooked oysters, crabs, eggs, except boiled, sausage, potted meats, rich gravies and soups, uncooked vegetables, cabbage, corn and turnips, pastry, confectionery, preserves, nuts, cheese, rich salads, pickles, desserts, hot bread and cakes, melted butter and buckwheat cakes.
Fresh fish and raw oysters; beef, lamb, mutton, chicken, turkey, fresh game, boiled eggs.	
Cooked vegetables and fruit in season; cold bread, toast and crackers, crushed wheat, hominy and rice.	
Tobacco in moderation to those accustomed to its use.	

THE METHODS OF TESTING FATS AND OILS.*

By DR. ERNEST MAILLIAU, Director of the Government Testing Laboratory at Marseilles, France.

THE French government and the Regency of Tunis have taken the opportunity of the great American World's Fair to bestow upon us the honor to communicate to you by conference and by practical experiments the analytical methods which we use in France to recognize the purity of the fatty bodies. I hope that you will give us your kind indulgence and facilitate our modest efforts with the good will which you have already shown to all our fellow countrymen who have come to you with the disinterested object of strengthening the scientific bonds which unite the two republics.

If the French and Tunisian governments have chosen me for their representative, it is only because I direct the ministerial laboratory of technical tests founded for the purpose of studying all the products of the colonies and Mediterranean district, and especially oils and fatty matters, as well as the different products which are connected with them, and that I have acquired some knowledge of the subject by long practice and continual investigations.

This is the only laboratory of its kind, and has been placed at Marseilles, the great seaport of France and port of entry for colonial products.

* Read at a special meeting of the Chemical Section of the Franklin Institute, June, 1893.—From the Journal.

The difficulties of chemical analyses of fatty matters are greatly increased, not only by the slight differences which characterize the various glycerides, but also by the numerous cases of isomerism, and the phenomena of oxidation and fermentation, which modify their molecular structures, by the resins and the essential oils which they contain, and also by the foreign matters which injuriously affect them, and the composition of which varies infinitely according to the nature of the soil from which the plant draws nourishment, by the method of extraction, age, and a thousand other causes needless to mention.

Since the methods of communication have been facilitated, and exchanges have become more numerous, the different markets of the world have been flooded with fatty matters presenting different characters, though of the same nature as those to which industry and commerce have been accustomed.

We have been led to seek methods of analysis for oils not by their impurities, which vary according to their origin, but by the examination of their principal constituents, which remain practically the same for the same species.

For example, it is now well known, and we state with pleasure, since we have made the first of these observations, that the olive oil of Tunis, Morocco and other provinces often presents the character of adulterated oils if analyzed without proper precautions or by old processes.

Accordingly, the greater number of governments and large companies have been obliged to modify their specifications to control the purchases necessitated by their wants by methods better adapted to the needs of commerce and the progress of science. Accordingly, before trying the action of chemical reagents upon this product, so extremely variable and alterable, it is indispensable for obtaining precise results to submit the material to a purification preceded and followed by a number of filtrations. By thus removing the impurities which when present alter the results, we bring back the fatty bodies of the same species to a type which is always practically the same. To reach this end we work sometimes by washing with hot distilled water, sometimes with strong or dilute alcohol, sometimes we refine the fatty matter by the use of caustic soda lye (containing ten per cent. sodium hydrate), employed in the proportion of ten per cent. of the fat. The emulsion is poured upon a saturated solution of sodium chloride, and by the action of gentle heat the different parts separate and the clear oil holding in suspension insoluble particles of soap rises quickly to the surface.

It is well to note that fatty matter, even when neutral as has been demonstrated, dissolves notable quantities of alcohol, which must be eliminated, if this method of washing has been employed. The process of the operation cannot be fixed definitely; it varies according to the nature of the impurities and the object of the research.

It is certain, for example, in determining the amount of volatile acids, we must be content with the simple filtration, and that when examining the oils of the crucifera we must not use caustic soda, which changes organic sulphur to a soluble sodium sulphide. Having finished the preliminary operations, we may, according to circumstances, operate directly on the neutral fat or the fatty acids prepared from it.

The fatty acids collected in the nascent state (that is to say, when they rise to the surface in a pasty mass) have much stronger chemical affinities than when melted and dehydrated. This difference is particularly remarkable in the examination of cotton seed and sesame oils. The black and red colorations obtained very clearly with a mixture of five per cent. upon the nascent fatty acids are not visible with the same fatty acids when melted.

The purification skillfully made does not destroy the chemical characters of the oil, as is easy to verify, by treating comparatively the same oil containing five per cent. of the fatty matter, the presence of which we wish to demonstrate. The reactions of the added material are in general intensified by these different treatments.

By working upon the fatty acids of the neutral oils, I have been able to demonstrate the purity of certain fatty matters which appeared adulterated and in which the presence of cotton seed and sesame oils was indicated by the old methods which I have been able to revise.

(*Circulaire du Ministre de la Marine Française*, en date du 26 Juillet, 1892. *Rapport du Résident-général de Tunisie*, en date du 9 Mai, 1892. *Circulaires des Ministres du Commerce et de l'Agriculture*, etc.)

I will know that in practice these preliminary operations may appear very tedious, but I do not advise their use except in cases where adulterations have been indicated by the usual methods, and it is desired to make the proof positive.

Besides, I cannot understand why a chemist has always been expected in the analysis of such delicate materials as fats to discover an infallible reagent, a single drop of which will immediately turn olive oil green, peanut black, sesame red, etc., so that any inexperienced person could discover adulteration and bring the perpetrator to justice. This requirement of the most difficult part of verification is absolutely incomprehensible and is only to be excused by the ignorance of those who ask it.

We will now proceed to the study of each oil in particular. We will pass rapidly over those which possess only a secondary interest, so as to lay greater stress upon those which are the object of a great number of sophistications, as for example olive oil. But in the first place we will indicate rapidly the general processes, physical and chemical, which are used for the identification of the various fats,

GENERAL METHODS.

(1) *Specific Gravity*.—Specific gravity is taken with accuracy by the Mohr balance, which is too well known to need description. It must be borne in mind that the specific gravity of the same fat varies greatly with individual samples, and this physical character is not sufficient to allow us to decide on purity or adulteration.

(2) *Action of Nitrous Fumes*.—We owe to a Marseilles gentleman, M. Poutet, the first serious proposition for recognizing certain adulterations of olive oil,