On the Junction of the Thames.
Perhaps there is no organ in the human body the microscopic structure of which the student becomes acquainted with in the course of his medical studies that creates more interest in his mind than the skin. The first ideas which naturally suggest themselves to his mind when for the first time a portion of skin is submitted to his view under the microscope may be the following. For what purpose has this organ been made so complex? Why are there so many tubes and other tissues. Why should vessels and nerves be necessary in this organ: in a membrane for ex-
euling and keeping together the important internal organs and for giving a finish to the whole frame. But as he advances in his studies, the importance of the skin becomes every day more evident, and his interest thereby increased. When he has had time and opportunity to read and reflect upon what has been written on the subject, he perceives the skin to have many more and higher functions to perform than he formerly had imagined; and that while the skin is complex in structure, it is also complex in function, and that therefore no organ in connection with the skin is superfluous but each has its special office to perform.

The Corium, or true skin, is composed of interlacing fibres, forming meshes or areolae, a beautiful object under the microscope, a membrane resembling a net in appearance; and being made up of fibres whose properties are toughness, flexibility and elasticity the student perceives, the Corium must be admirably fitted for protecting the internal organs of the body from external violence. The fibres
which by their interlacement compose this organ, moreover, have not all the same properties, and are not equally distributed. By careful and repeated observations two varieties of fibre can be distinguished, namely the white fibrous and yellow elastic fibrous tissue. Where is the disproportion greatest? The yellow variety, whose property is elasticity, is only found where it should be found; namely, in greatest abundance in the neighbourhood of such parts of the skin, as are liable to be distended; there, the corium is rendered capable of maintaining its own integrity, at the same time that it is prevented from opposing any obstacle to the free movements of the body. In parts where elasticity of the skin is not so much required, the white fibrous tissue constitutes its chief element.

By studying the minute structure of the corium, the properties of its elementary tissues and the manner of arrangement and distribution of these; the true skin is
been to be beautifully fitted in every respect for serving as an external integument to the body. But it is also vascular, and nerves are seen to ramify in it in abundance. The vessels are of two kinds; there are vessels for conveying blood and vessels for receiving lymph. How these are distributed and where they terminate, forms another interesting subject of investigation. This, however, cannot be considered at present.

Resting upon the corium are layers of cells with nuclei in their interior, called the epi-
dermal cells, and when taken collectively, they form the epidermis or cuticle of authors. The epidermis covers at every point the true skin, is very various as to thickness on different parts of the body, and by the fact of its being very thick on parts liable to pressure and local injuries, protection would appear to be its chief office. It may therefore be called a membrane epidermi-
ous nerves, blood vessels more lymphatics, permeate this membrane: it forms a turn-
ing point, so to speak, to these. The vessels
and nerves are confined to the corium. The blood vessels of this latter organ may be injected and are seen to form a most beautiful network, but injection in no instance exhibits vessels penetrating the superficial envelope, the epidermis. As arteries do in general, the blood vessels in the corium terminate in capillaries and join capillary veins. Lymphatics undoubtedly are abundant in the corium but are absent in the epidermis. Where and how the nerves terminate is an interesting question, but a difficult one to determine. No doubt however can be entertained of their presence in the true skin and of their absence in the cuticle and this is what is most important to consider in relation to the functions of the skin. By careful examination of the minute structure of the corium, nerves may be distinguished and so numerous are they, and so close are their loops, that one might almost say the structure of the corium consists as much of nerves
as it does of the fibrous tissues and bloodvessels. But the nerves, blood vessels, and lymphatics, have, of course, very different functions to perform from the fibrous tissues. The fibrous tissues enter into the structure of the true skin in order to form a strong, tough and elastic protective organ. As a protective organ it must be nourished so that it may be able to perform this function: the blood vessels and lymphatics then, must be destined to accomplish this. The arteries to convey nutritive matters to the true skin; the veins and lymphatics to remove the disintegrated materials. The nerves perform a function different from all these. They may contribute to the nutrition of the true skin, as the proper nourishment of other parts of the body is well known to be influenced by nervous force; they may do this, but they certainly do more, for they give to the skin a degree of sensibility which is highly characteristic of an animal life.
On the surface of the corium little eminences are seen. These little eminences, called papillae, are prolongations of the corium itself. Into each of these a small artery may be distinctly seen to enter, then to terminate in the usual way by joining a returning vein; and along with these, a transparent-looking fibre is seen, which the observer has every reason to believe is a nerve—so he naturally comes to the conclusion, that these little eminences are the immediate seat of the sense of touch.

The cuticle, as has been already seen, is neither vascular nor sensitive. It is not requisite that arteries should ramify in the substance of the epidermis for its growing centre, so to speak, is in contact with the very vascular corium, and as cell after cell is formed, becomes developed, lives its time and serves its purpose, it is cast off at the surface as a cementitious: neither, therefore, are absorbing vessels, lymphatics or veins, at all requisite. The epidermis is also non-sensitive; if it were not it would defeat the very purpose
for which it is designed. What is the office of the epidermis? Is it to make smooth the surface of the true skin, which is rendered rough by the prominence of the papillae, and so to give a finish to it, as plaster is put upon a wall to hide its coarse appearance? The epidermis does do this, but it has a higher office to perform than that of merely concealing. The epidermis ministers to the sense of touch: it shields the delicate corium without impairing its sensibility, and by its being thicker between the papillae than it is on their surface, it serves to subdivide the percipient surface of the skin into a number of isolated points, each of which is capable of receiving a distinct impression from an external body. The little papillae are highly sensitive, and if they were not protected by a non-sensitive envelope, touch would be imperfect and pain associating from the slightest cause. How often is such experience when from any cause the epidermal covering has been removed?
How beautifully, then, is the sensitive corium protected, and how admirably is the true skin adapted for being the seat of this important junction touch! The plan and arrangement of all its parts do not interfere with it; on the contrary, all contribute to its perfection. The corium by its reticulated structure, allows of a free and extensive ramification of sensitive nerves and blood vessels to nourish these nerves; the corium is also raised into innumerable little prominences, in order that every nerve fibre may be completely isolated so that the tangible qualities of bodies may be more easily, quickly and perfectly perceived; and the epidermis or cuticle, which at every point surrounds, and covers each of these papillae, affords its protection without interfering with its function—being in fact the medium through which the sensitive nerve fibre in its interior receives impressions, and conveys them to the sensorium.

But there are other structures found in
connection with the skin, and functions are performed by them of a wholly different nature. By the slightest glance at the skin even with the aid of a single lens, it may be seen to be perforated by innumerable foramina. These foramina are at once distinguished from the areolae of the true skin, by employing a higher magnifying power. When a section of the skin is made perpendicular to the surface, and the same high magnifying power used, the observer can demonstrate to his entire satisfaction these perforations. He believes them no longer to be mere perforations but distinct tubes. He can detect them passing through the cuticle, the corium, and even trace them into the subcutaneous cellular tissue, where he sees them to be convoluted upon themselves. With a single lens also, he may discover little bodies in connection with the hair follicles in appearance resembling certain of the conglomerate glands. A higher magnifying power as in the former case shows them to possess the same elements as glandular organs, namely, a basement membrane lined by cells.
A basement membrane can also be made out in the interior of the convoluted tubes; and this is covered likewise on its internal surface with cells. Is one of these little bodies a gland and the other not? Is neither the one nor the other a gland? Or are both to be regarded as glands? Their elementary constituents are similar in appearance, but the form of the two organs is dissimilar. The one is tubular throughout; the other is tubular where it opens into the follicle, but at its other extremity it is dilated into numbers of little pouches or sacculi. It is a well-ascertained fact that cells elaborate secretions, and that they are essential for secretion; and moreover, that the complexity of the larger secreting organs, is no proof that one much simpler in form may not be a secreting organ also—and vice versa. They may and do secrete matters of very different composition, but it is the cells in their interior which possess this selective property. Every organ for secreting matters from the blood, as is well known, must be supplied with nervous force and also with blood through the instrumentality
of blood vessels. How it is just as essential that it shall contain cells; and although it is not necessary that these cells should be in absolute contact with the blood, yet they must be allowed such close proximity with this fluid, as will enable them to attract the peculiar matters which they are designed to remove. The large and complex glands possess all these qualifications, but to do the smallest and most simple in form. Each little follicle in the intestines possesses the same although it is very simple in form. In the very same intestine for example, is found an organ more complicated as to form, which has a duct-terminating in numerous little flask shaped dilatations, consisting of every thing essential; and consequently, in the true sense, glandular as much as the other. These two glandular organs, the gland of Lieberkuhn (the simple follicle) and the gland of Brunner (the lacellated gland) in a remarkable manner resemble in form and appearance the tubular and lobulated bodies in the skin: and one would naturally suppose that this is sufficient to prove
that these bodies in the skin are glands. Accordingly, Chemists and Physiologists have proved that these are indeed glands, and have even detected secretions in them. Moreover, by analysis they have shown that products of very different chemical composition are yielded by the two varieties of glandular organisms found in the skin. The tubular glands yield a watery fluid, and these they have called the sudoriparous glands; whilst the sebaceous glands, secret a fatty or oily matter and hence these have been termed the sebaceous glands.

The skin then not only forms a protective investment to the body, and an organ of touch, but it is also a secreting organ. But on looking at a portion of skin, even under the microscope, these little glandular bodies appear very small and their number not great, and it might seem that they could not perform any function, as secreting glands, of much importance to the economy; that they could not influence the chemical composition of the blood to any considerable degree. But by further consideration it seems quite the reverse.
When their closeness of arrangement is considered, the extensive surface over which they are spread and consequently their enormous number, the importance of the skin as an organ of secretion becomes more and more apparent. For if in connection with every hair follicle one sebaceous gland or a couple of them exist, as is most common, their number must be vast. And so also with regard to the number of the tubular glands; for their average number, according to the calculation of Dr. Graziades Wilson, may be about seven million on the whole surface of the body. The length of tube also must be very great. I had almost said incredible; for the same author states, that if imagining it possible to unroll every one of the tubular glands and place them end to end, a tube would result which would extend the length of twenty-eight miles.

In order, however, to estimate correctly the value of the skin as a secreting organ, and to ascertain how it affects the health or life of the individual, we must not only study the form of these glands, and the extent of their secreting
surface, but we must analyse their healthy products, and the effects produced by the perspiration of the function of the skin as a secreting organ. But in this endeavour, we are met by difficulties almost insuperable. The fact of the atmosphere having a tendency to remove such products from the surface as are capable of assuming the form of vapour, has attracted the attention of many eminent Physiologists since a very remote period. These substances they include under the term air perspiration, whilst all those matters, which, under ordinary circumstances, the atmosphere could not remove, they termed the sensible perspiration.

Many ingenious experiments have been made for the purpose of collecting and analysing the sensible perspiration, but to enumerate the many results, and the manner in which such experiments have from time been conducted, would, even if I were able to do so, only be repeating imperfectly the descriptions already ably and fully recorded.

Watery vapour appears to have been a universal result. Carbonic acid gas a result obtained by most.
How if this gas as an invariable rule is secreted by the sudoriparous glands, and if water which no one doubts is secreted by them, then a junction must be performed by the skin analogous to that performed by the lungs, for these are the very substances (water and carbonic acid) which it is the office of the lungs to remove. These are certainly excrentitious substances; for upon the removal of them from the blood, depends not only the health but even the life of the individual. The importance of the skin as a purifier of the blood must therefore be very great.

But by careful and minute analysis of the products of the sudoriparous glands, other substances have been found than those which can be detected in the insensible perspiration. Salts of soda, Potash, Lime have been found, urea, with the Hydrosclerotic and the Lactate of Ammonia; and various free acids, such as the Acetic, Lactic and Butyric have all been detected. By secreting such matters as these, the skin differs from the lungs. The skin must act vicariously with both the lungs and kidneys.
The skin must be both a respiratory and a simple, though important, excretory organ. Now it is not to be wondered at that very serious results should follow the non-elimination of such substances from the blood. Varnishing the skin of certain of the lower animals has been followed by death; they have died asphyxiated. To the retention of what substance in the blood is the death owing may naturally be asked. Carbonic acid gas is well known to be very poisonous; it is poisonous as to be capable of producing death; but an undue fluidity of the blood must also be very hurtful and as the water cannot then be secreted by the skin in sufficient amount, the salts and other substances which it should hold in solution, and deposit on the surface as it evaporates must be retained also in the blood. But again one might say, if death were owing to the retention of one of these substances, or of all combined, the lungs and kidneys might take on an increased action and be maintained the purity of the blood. If it were due to carbonic acid, one might think that the lungs
whose office it is, in a much higher degree to remove that poison from the blood, might be quite sufficient—at least for a time, if nothing interfered with the access of pure air into them, to free the blood of this impurity; and if the water with the other substances contained in it could their presence be the cause of such a result? The kidneys, a person might imagine, could easily secrete these, and to keep up the purity of the blood. For the kidneys, as is well known, secrete a larger quantity of urine in winter than in summer when more watery exhalation takes place from the skin and lungs; and the salts and acids, as they vary in character and quantity in different analyses, seem to denote their presence, absence, abundance or deficiency in the blood, and that they are simply excreted by the sudoriferous glands. Now the kidneys appear also to have no choice or selective property, and one might be led to expect that when an animal has its skin varnished over, the kidneys might also remove these substances sufficiently evident is it—however, that these substances are all excrements and that their
Is the suffering of perspiration a cause of success as such? Boudin.
free elimination from the blood is of the utmost importance to the economy; and also that not either the lungs, nor the kidneys are capable of excreting exactly the same materials, but it must always remain a very difficult question indeed to determine what are the matters which are naturally secreted by the skin, whose presence gives rise to such fatal results when the skin is prevented from performing its function.

Of course no such immediately fatal results have been seen to take place from complete suspension of the secreting function of the skin in man, such experiments as those performed on the lower animals being in his case unwarrantable; but analysis of the products of the sudoriparous glands must lead one also to believe the great importance of the skin as an excreting organ, an organ for purifying the blood, and rendering it fit for nourishing the body; and that in man, as in the lower animals, this function must be of as great importance to his health if not his life.
An oily matter as formerly considered is secreted by the sebaceous glands; they pour forth this secretion on the surface of the skin, it remains there and forms part of the insensible perspiration. How the question arises, is this secretion excretions like all the other matters hitherto seen to be secreted by the sudoriporous glands, or is it secreted from the blood that it may serve a further purpose. This fatty matter is generally considered as being secreted that it may serve a further purpose. It is by it that the skin is rendered more pliable than it otherwise would be—a condition absolutely essential in order that this organ shall perform its function as an external integument to the body. As the integrity of the epidermis is necessary in order that it may afford protection to the sensitive corium; and as it might be otherwise a very brittle membrane, being composed entirely of cells, this oily fluid would appear to soften it, and prevent or aid in preventing piercing and excoriation. It protects the skin from irritating substances,
and in the newly-born infant it is exp.
pensed to be of service in protecting the skin from the liquor amnii and other fluids during parturition. The sebaceous glands are observed on the tip of the nose of the sucking infant; on its lips within as well as without; on its chin, cheeks and con.
tiguous parts—a defence, under which these parts are exposed with impunity to the contact of the milk; whilst the organ in the mother which supplies it is protected from irritation by the same beneficent con.
tivance. This shows the importance of the little sebaceous glands. But may not this oily matter be excrementitious as well as the products of the sudoriparous glands? Undoubtedly it must be essentially so. It may also be of service in preventing undue evaporation, and if it is capable of preventing evaporation it must choke up the little orifices of the sudoriparous glands, in fact it must act the part of a varnish and prevent these little glands from performing their function.

Now it is not wonderful, seeing that no other
glandular organ in the body can remove exactly the same materials as those secreted by the skin, that inattention to cleanliness should be such a powerful predisposing cause to disease. The commencement of many diseases is ascribed to want of cleanliness; and many other diseases are been rapidly to abate after a copious secretion of sweat.

All the matters secreted by the skin must be excreted, and the more freely the skin is permitted to excrete these matters, the better will be the health of the individual.

The state of the atmosphere must influence the thorough removal of certain substances secreted by the skin; substances, as formerly considered, which are capable of mixing with it—but whatever be the condition of the atmosphere if it does not get access to the skin it cannot of course assist the process of secretion at all.

But bathing, or otherwise washing the surface of the body, removes all the products of the sensible perspiration, alike those of the sudoriparous and of the sebaceous glands as well as all foreign matters which these secretions may have caused.
to accumulate on the surface, and the atmo-
spheric air, then comes in close contact with
the skin. The water and carbonic acid, and
other gaseous and fluid substances, are then carried
off as rapidly as they are brought to the surface
and, as the little gland ducts will be cleared
the saline and other substances will be se-
creted in greater quantities a fresh secretion
will be poured out by the sebaceous glands
which will purify the blood, and soften the
skin, but when it has again accumulated
in excess, it becomes of the utmost importance
that it shall be removed, in order that a
healthy secreting action be kept up by the
skin. A much more comfortable heat per-
vades the system after a thorough clean-
zing of the skin, evidently, because then
the chemical combinations and decompos-
itons are permitted to go on more freely
between the blood and the atmosphere of
gas being absorbed perhaps, carbonic acid
given off; for the skin is an organ of res-
piration. Cleanliness, therefore, must be
very important—auxiliary to the function.
of the little glands in the skin; and consequently essential for maintaining the purity of the blood and keeping up the temperature of the body.

Clothes are said to be warm or cold according to their quality or texture. But it is after the removal of all such matters from the surface that tend to exclude atmospheric air that their good effects are manifested.

Just as cleanliness is clothing. Proper clothing is most essential for the regulation of the function of the skin as a secreting organ. One may say proper clothing, because there are two varieties, the porous and non-porous. The latter of course is bad. As its being made next to it is not quite impermeable to the access of air it not only does not keep in as it were the heat generated in the body, as seems to be intended, but the body actually after a time becomes colder; and possibly if the whole body were covered with such an article of dress for a sufficient length of time, effects similar to those produced
in animals whose skin was varnished might probably follow. But proper clothing is as beneficial as improper clothing is harmful and needs no comment. Of course in reality, but, in so far as it relates to the health of the body by assisting the functions of the skin. In the first place, it maintains the temperature of the body by preventing the animal heat from passing off by radiation, being itself a non-conductor of heat. Secondly, by its being open enough in texture it allows entrance of air, and exit of the gaseous products of the little glands; and thirdly, when from excess or exercise or any other circumstance which tends to cause a greater than ordinary amount of watery fluid to be secreted, it will absorb this while the atmosphere by pervading its whole length is sufficient for its removal.

Moreover, the quantity of clothes worn is of the utmost importance to the maintenance of health. As the body is ever exposed to the many vicissitudes of climate and season, the amount must be varied to meet these
changes. The body nevertheless must be always sufficiently clad with suitable clothing for the reasons already considered. Seeing that these little matters are so often very ill attended to, it is not to be wondered that many diseases both acute and chronic should ensue.

The skin is truly a very delicate organ, as regards this function, and as perhaps there is no function performed by any secreting organ in the body more important to health, and none more liable to be deranged from so many and what would appear slight causes, the greatest attention should be paid to it, and every means employed to regulate its function in order that the individual may guard against the many calamities which may be in wait for him.

Finally, the skin possesses the property of absorption. It appears curious that water should be absorbed by the skin and secreted by the same organ; but that the skin does such has been sufficiently proved. It can absorb solid matters also to a slight degree, and various gases may be absorbed by the skin.
as shown by experiment. Still more strong however is the fact, that whilst carbonic acid gas is given off by the skin, the very same gas may be absorbed by it; and yet it must be true, for Mr. Abernethy observed, when he held his hands in a jar of carbonic acid over mercury, that the volume of the gas became diminished. This would appear to be sufficient to put down the theory of the skin being a respiratory organ. But, after all it merely shows that the skin can absorb this gas, and that it is obliged to do so, so to speak, under the circumstances it does not show that it has a preference for it; in fact the skin can absorb almost any gas. The lungs can absorb carbonic acid gas also as has been too often observed; but that they can do it—does not prove that they do so it—naturally. The evil effects produced by the absorption at the lungs, is sufficient to prove that it is not their office to absorb carbonic acid gas but to give it off.

In conclusion, then, the skin is truly
a beautiful and complex looking structure, every part and portion of it having an important office to perform, although they are all very minute and even microscopic. The study of its secretions is interesting to a degree very far beyond what is often imagined, and I only regret that the limits of an Essay like this preclude me from entering more fully upon many considerations of the highest importance in the practice of medicine.