

4 Skin, Very Close Up

I'm interested in how the skin works because it's the part of my body I'm most familiar with, and I think the better I understand it, the better I can take care of it.

—Camille, 48, book publisher

Until you suffer a bad sunburn, have a close encounter with a patch of poison ivy, or notice you don't quite look the way you'd like to look, you probably don't think much about your skin. If you're a runner, your joints are on your mind daily. If you lift weights, you visualize your muscle mass growing with each repetition. If your vision is changing, you probably fuss with decisions about your eyewear or laser eye surgery. But skin is an organ that, in the words of a retired surgeon I know, "we take for granted."

Among the many reasons that we are able to take our skin for granted is the amazing reliability and durability of this important organ. Our skin weighs only about nine pounds but buttresses us against all manner of slings and arrows: sun, cold, a razor's edge, viruses, germs, and little burns. It varies in thickness with such remarkable precision that it can be flexible where needed (around the eyes,

for example) and stiff and rigid where flexibility would be a handicap (the palms and soles). The skin on our eyelids is about half a millimeter thick (1 millimeter is about the thickness of the lead in a standard No. 2 pencil). The skin on the soles is about 5 millimeters, ten times the thickness of the eyelid skin. In general, where the skin is sensitive, it is also very thin. In areas where it is subject to friction and calluses might form, it is likely to be thicker. Where the skin is always moving and subject to stress like the back of the neck, it is also thicker. Most people are thick-necked, at least dermatologically speaking.

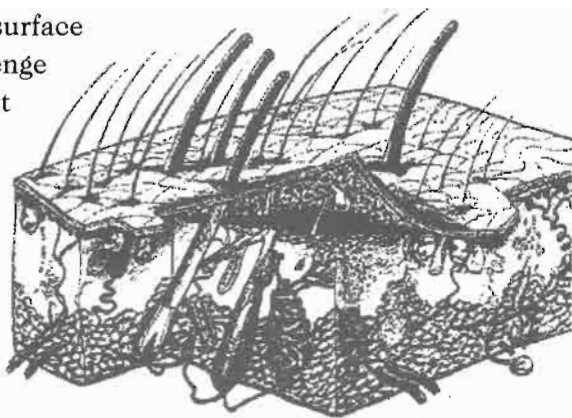
The protection the skin provides us as our first defense against the outside world is due as much to its complex physiology as to its physical strength and flexibility. The skin has a remarkable array of nerves that sense pressure, pain, heat, and cold; cells that wander from the bone marrow to the skin and back; cells that produce pheromones to attract the opposite sex; cells that make sweat to cool us off; blood vessels that can constrict to keep us warm on a wintry night. The skin, in short, is a vast, dynamic organ. To take good care of it, it helps to understand how it functions. Learning about the skin, very close up, is certain to heighten your appreciation of this most obvious of organs.

▪ INSIDE OUR HOUSE

Most of us have a good basic knowledge of the body's important organs. Our heart has four chambers and serves as a pump. Our brain has two halves and functions like an enormous computer. Our kidneys are bean shaped, nestle just below our ribs in the back, and function as efficient filters, much like a sewage treatment plant. Our eyes work just like a camera.

But what about our skin? The wonder of skin resides in its clever design. Imagine how you would construct a covering for a house that was to be built in an area with a climate of extremes. The winters are very, very cold and during that time the interior of the house is heated artificially. In summer, the exterior temperature rises high as the sun beats down upon the outside, while the inside of the structure must maintain a constant temperature. The heat and cold cause expansion and contraction on the outside of the structure, putting more stresses on the covering. (This is similar to what happens to bridges in northern climates, which crack and deteriorate sooner than the roadways leading to them. Because they hang out in open air, they freeze first in cold weather and are more subject to expanding and contracting, which

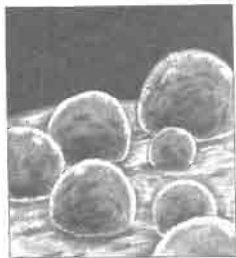
causes cracking in the surface material.) Add to the challenge of temperature the fact that this house you are building is in the middle of a war zone. At any moment sharp objects or exploding missiles could land on and even penetrate the surface. Sometimes the missiles are so tiny they are unnoticeable. At other times the threat to the outside of the house even comes from within. Surely, the sheathing on



Cross-section of skin showing its complexity with hair follicles in different stages of growth, sweat glands and ducts, blood vessels, and nerves.

this building would have to be dynamic, combining the strength of Tyvek with the reflecting features of aluminum and the mass and strength of bricks.

Skin sets the standard for how a complex, multilayered structure, embedded with specialized parts, can serve a host of functions. While the heart pumps, the kidneys filter, the brain thinks, and the eyes see, the skin must do many different things at once. Here are four examples of specialized parts of the skin, each performing its own task.



Beads of sweat under the electron microscope

1. Our *sweat glands* allow heat to evaporate, so that we don't get overheated. (More amazingly, in winter we don't have to fill up with antifreeze and we never rust.)
2. Our *lymph channels*, integral to the design of the skin, perforate every inch of skin and whisk away bacteria, other germs, and even the residue such microorganisms leave behind.
3. Our *hair follicles*, proud reminders of our fine-feathered evolutionary cousins, not only serve to make us attractive to the opposite sex but are important for the sensation of touch, yet another job of skin.

4. Our *nails* allow us to pick up a dime (or the tab) and let us scratch, a paradoxically pleasurable experience.

The skin, then, is not just a complex covering. In this brief journey down through the layers of skin, think about your own special skin nuisance and where the problem might reside. Later chapters will tell you how to fix it.

▪ MILLE-FEUILLE OR NAPOLEON

Regardless of the word you use to order this rich pastry, the mille-feuille (or napoleon) has a structure that can illustrate the layers of the human skin. The hard white frosting is analogous to the stratum corneum, the compact but scaly surface produced by the epidermis. The top layers of thin, undulating pastry leaves are similar to the epidermis. The thicker, denser layer of custard is like the dermis. Once your fork strikes the hard ceramic surface of the plate, you've reached the bone under the skin.

To get a complete sense of the complexity of the skin, let's continue with more food imagery. Imagine a cutaway side view of a summer garden. Imagine that after being planted with potatoes, carrots, and radishes, the garden isn't very well tended. Eventually it becomes overgrown with a variety of plants whose roots extend under the surface and intertwine extensively. In our cutaway view the top layer of fertilized soil represents the epidermis. The various tubers represent the appendages of the skin, such as the sweat glands, the oil glands, the hair follicles, and even the nerves; these *adnexal* (pronounced add-NECK-sull) structures form during the third month of fetal development, growing down like roots from the brand-new epidermis. Sweat glands develop in certain parts of the body while apocrine sweat glands—the kind that produce body scent and pheromones—develop in specialized areas. This web of structures adds purpose and dimension to the skin as a whole.

▪ THE HORNY LAYER AND THE EPIDERMIS

Although we speak about the epidermis as the top layer of skin, it also comes with a covering. Take a look at the ball of your foot. Do you see how thick the skin is? Much of the thickness is due to this very top layer, called the stratum corneum or horny layer, which forms a protective covering. In certain parts of the body, this covering can be dense, while it may be barely

noticeable elsewhere. Under the microscope it looks like a basket weave. If you want to see the stratum corneum, take a look at your hairbrush. The many flakes you see (in fact, they're dandruff) is the keratin that has survived after production by the keratinocytes (also called the epidermal cells) and includes some dead keratinocytes as well. In some skin conditions, the body makes too much keratin and little rough bumps or patches can develop. In general, though, we best know it on a daily basis when it develops in excess in the form of callus.

How many layers does the skin have? That depends on whether you are talking about the big layers or the layers within layers. Broadly speaking, the skin consists of three layers: the epidermis, the dermis, and the subcutis, or fatty layer. But the epidermis itself, thin as the book page you are holding in your hand, has itself many layers of cells.

Cells are the basic building block of the body. In any local pond you could find small, single-celled organisms; any one of these amoebas contains all the machine parts for daily activity. In humans and in other vertebrates, billions of different cells, each with its own function, join together in a tight confederation to make organs, all of which add up to a full-blown, complex body. In humans, cells are what doctors and scientists study to understand in part how the body works. They can be seen only under the microscope, where it becomes quite obvious just how busy each cell is. To give you an idea of how small cells are, it would take about 750 million to fill an area the size of a pencil eraser.

The outermost layer of the skin, the epidermis and its horny covering, is in constant contact with the environment. Snow melts on it, water rolls off it, sunlight darkens it, sharp edges scrape it, and aging etches lines in it. The epidermis is formed by multiple layers of single cells called *keratinocytes* (pronounced KER-a-tin-o-sites) whose job it is to make keratin, a family of tough proteins. The job of keratin, in turn, is to protect the epidermis.

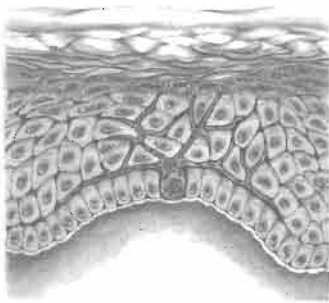
The keratinocyte is also important to understand because it is the origin of most skin cancers. Keratinocytes also make hair and nails, which are composed of keratin. Keratinocytes make up roughly 95 percent of the cells of the epidermis and originate as basal cells just where the epidermis fuses with the dermis.

The epidermis is not impermeable. It is not supposed to be. Were it like latex, we would all walk around overheated and uncomfortable. Although it does share the property of flexibility with latex, there are other features to its fine design that make it especially adaptable to the ever-changing, always threatening circumstances of our environment.

It is the epidermis that we assault with abrasive pads, astringents, facials, crushed apricot pits, chemicals, the new miracle creams, the old miracle creams, natural miracle creams, makeups of all kinds, and oils. That the epidermis can tolerate these attacks, and in some cases even respond positively to them, is remarkable. Such resilience is made possible because the epidermis is designed to regenerate itself regularly.

Within the epidermis are four specific layers: the basal layer, the prickle layer, the granular layer, and the horny layer. Basal cells, so called because they are at the lowest level, produce two new cells each time they divide. One remains in the basal layer to make more new keratinocytes, while the other slowly moves in step fashion through the full thickness of the epidermis, changing its shape as it does so. Originally a small round cell, a basal cell flattens out as it passes up through the skin to the surface of the epidermis. Normally, epidermal cells take about fourteen days to travel from the basal layer to the surface. By the time this keratinocyte makes it to the top layer of the skin it has lost its nucleus or DNA material and is very, very flat.

How these keratinocytes hold together is extremely important. Were they not able to adhere to one another you would not be able to hold this book, much less read it. We know that the cell membranes, or outer envelope of keratinocytes, make specialized plates, which look almost like door hinges. In this fashion, cells link up one to the other, creating a continuous covering over the body but one that is permeable to a variety of compounds. When there are problems with this networking of keratinocytes, certain rare but serious skin diseases result.



A single melanocyte or pigment cell among many keratinocytes

The epidermis itself includes two other cell types besides the keratinocytes; these are melanocytes and Langerhans cells. *Melanocytes* (pronounced MEL-a-no-sites) are the cells of the epidermis that produce pigment. These small, octopus-shaped cells dot the basal layer of the epidermis, populating it at a frequency of one melanocyte for every ten basal keratinocytes.

Melanocytes are responsible for the color of our skin; without melanocytes, there would be no races, no people of color, and the absence of these cells can make sun a serious hazard for people not of color. The number of melanocytes in the epidermis is the same, regardless of race or color. It is the number and size of the

pigment granules manufactured by these melanocytes, called *melanosomes*, that determine racial difference in skin color. Pigment cells of dark-skinned individuals synthesize larger melanosomes than those produced in light-skinned individuals.

The social, political, and historical issues raised by melanocytes go beyond race. The function of these cells can have an astounding impact on the quality of human life. The absence of pigmentation, or *vitiligo* (pronounced vit-i-LIE-go), is especially important worldwide because of the association of depigmented patches or even large areas of pigment loss with leprosy, and the fact that lepers have been shunned throughout history. Albinism is another condition in which the number of melanocytes is normal but individuals are unable to fully manufacture melanosomes—a total absence of color occurs. Just as lepers have been shunned, albinos have also suffered social and cultural prejudice.

One purpose of skin pigment seems to be to protect against the sun. For example, chronic sun exposure can fool the pigment-producing cell into making larger melanosomes, thereby causing a tan. A tan is the body's response to injury from ultraviolet radiation. When one looks at epidermal cells under the microscope after they have been exposed to the sun, it is amazing to note how the granules of pigment sit over the nucleus of the keratinocyte like a skullcap. It appears that the pigment is attempting to shield the DNA of the nucleus from the harmful mutating effects of the sun.

Despite the admirable purpose of melanocytes, they, like everything else in the body, can at some point go awry. When melanocytes behave badly, they turn into melanoma, a high-risk skin cancer that is increasing in incidence.

The *Langerhans cell*, named after the scientist who discovered it, is a member of another class of cells that populate the skin as well. The Langerhans cell is found scattered among keratinocytes in the middle region of the epidermis, as well as in the dermis. It is believed that Langerhans cells monitor immune reactions of the skin, functioning not unlike an alert police officer. Prominent among these reactions are rashes, such as poison ivy.

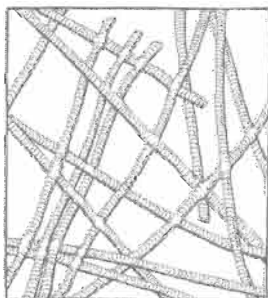
The immunology of the skin is an area where remarkable scientific advances have been made over the past two decades. For some time we have known that there had to be some connection between our skin and our immunity. For example, certain diseases of the immune system, such as lupus erythematosus, often are accompanied by skin changes. Many other diseases in this category also cause changes that are sometimes first detected in the skin. A sort of information superhighway runs from the

THE HOLY GRAIL OF ARTIFICIAL SKIN

The complexity of our skin is demonstrated by the difficulty in developing artificial skin, which is considered the Holy Grail of skin biotechnology. Several products have been developed, but so far we have failed to create anything more than a sandwich of epidermis and dermis. In one such material epidermis is formed from skin cells cultured from the foreskins of circumcised infant boys and the dermis or collagen is made in the test tube from collagen derived from cows. So far, clinical trials indicate this serves as a good biological dressing that can help heal leg ulcers. Nevertheless, it is not yet possible to make skin with all the bells and whistles—hair follicles, sweat glands, lymph channels, and blood vessels—that would make it function as the “real thing.”

skin through to the bone marrow and the spleen, and on even into the brain; this system ties in our skin with the daily immunologic surveillance that protects us from external invasion. Langerhans cells play an important role in reactions as common as poison ivy and allergy to nickel or other compounds that come in contact with our skin.

▪ THE DERMIS



Collagen fibers as seen magnified thousands of times under the microscope

The dermis is the second layer of the skin. It is the resilient, durable, and flexible infrastructure upon which the epidermis sits. Epidermis alone is rather flimsy. If you have ever fallen off a bicycle, palm outstretched to break the fall, and emerged with a huge scrape, you know how thin the epidermis is. Strength is provided by the dermis, which essentially holds everything together. The dermis is also home to all the specialized parts that make skin what it is and that have proven so hard to imitate in our search for artificial skin.

The main component of the dermis is *collagen*. Collagen is not just an ingredient in the latest anti-aging cream. It is first and fore-

most a protein that is found in skin, tendons, ligaments, and lining covering bones throughout the body. In fact, 70 percent of the dry weight of skin is made of collagen, a very versatile protein.

It is collagen that degenerates with age, leading to wrinkles and sagging skin. It is collagen that heals skin wounds. It is collagen and its partner, elastin, that are so damaged by excessive sunlight that lines, wrinkles, and even small yellowish bumps can develop on the skin. It is collagen that overproduces in people who make bad scars. And it is because collagen is so important to the health and appearance of skin that the cosmetics industry has spent millions attempting to re-create it, control it, inject it, stimulate it, capture it in cobalt blue designer bottles, and apply it to the surface of your skin—all in an effort to make it right once again.

Collagen is made by *fibroblasts*, small cigar-shaped cells that populate the dermis throughout the body. Each fibroblast cell produces a spiral chain of collagen molecules that join together like thick braids. Once the braids of collagen are woven into bundles and the bundles are in turn woven into netlike arrays, the final collagen has been synthesized.

Collagen is rich in amino acids, such as hydroxyproline, hydroxyglycine, and glycine. I mention these specific names because it is not uncommon to see these amino acids on sale in health food stores, with the promise that they will improve skin quality and enhance appearance. But current science does not support the claim that these amino acids, when taken by mouth or applied as a cream, can actually improve collagen in the skin. To date, the only FDA-approved agent that has been shown to stimulate collagen production in skin is Retin-A, known chemically as tretinoin. This is a vitamin A-type compound; it is not the same

MEASURING AGING SKIN

Over a decade ago, while still a research fellow, I teamed up with a cardiologist who was studying the use of lasers to diagnose arteriosclerosis, or hardening of the arteries. Elastin is important in our blood vessels, but we knew it was important in skin as well. We developed a laser device that could detect changes in elastin and collagen in the skin just by shining a light on the skin. From the pattern of light that was reflected back and measured we could tell if damage to the skin was due to aging alone or the effects of ultraviolet radiation from the sun as well.

as retinol or other vitamin A chemicals that are sold in over-the-counter anti-aging creams.

Another vital element of the dermis is *elastin*. The stretchy fibers of elastin are different from collagen. They consist of fine filaments of protein that do what the name implies: act like an elastic band. When stretched, healthy elastin allows the skin to snap back into place. With time and sun, elastin in the skin deteriorates; this is a primary cause of the loss of “snap” in your skin.

In certain disorders, there are congenital abnormalities of collagen and elastin. In these situations, healing can be impaired. Other abnormalities of elastinlike molecules can lead to loose joints. President Abraham Lincoln is thought to have suffered from Marfan’s syndrome, which is due to an abnormality of this sort.

As far as I know, elastin cannot be replaced or fixed with creams applied to the surface of the skin. What remains unalterably true is that the effects of sun can be devastating. Under the microscope, skin exposed to the sun shows broken fragments of elastin where there should be long, wavy bands.

▪ WAIT, THERE’S MORE!

The dermis consists of more than just collagen and elastin. It is also home base for an extensive network of blood vessels and lymph channels. The dermis is rich in nerves. Special bulbs of nerve tissue, each serving a particular sensation, are distributed throughout the skin.

Pacini corpuscles are among the most amazing nerve endings. Located deep in weight-bearing areas, they detect pressure. Other nerve endings provide for the exquisite sense of touch. To see just how, put this book down for a moment. Can you tell precisely where on your fingertips you were holding the pages? Of course you can. What’s even more amazing is that you can probably distinguish the exact spot within a millimeter. That is how precise these nerve endings are.

Other sensations transmitted by nerves in the skin include temperature, pain, and itching. These sensations pass to the brain by way of nerves that track back to the spinal column. When this system works well, it works very well. When it is shaken up by illness, it can be troublesome—for instance, in the case of shingles and the pain that comes with it.

■ SWEAT OR PERSPIRATION: IT ALL DEPENDS ON WHO'S MAKING IT

The old rule of thumb is that men sweat, women perspire. Don't sweat it. It's really all the same. Perhaps sweat is what causes social problems, while perspiration is what makes up, according to Thomas Edison, 99 percent of the creative process.

That sweating is viewed as undesirable is proven by the huge variety of antiperspirant deodorants that are on the market. Certainly, individuals who sweat excessively have a major social problem. Happily, new work with botulinum toxin, known commercially as Botox and already used for treating wrinkles, may benefit people with excessive sweating. Another abnormal situation occurs in people who are born without sweat glands. Such individuals have major problems with regulating heat; their body temperatures rise very high, with all the attendant discomfort.

The truth is, we must sweat it. Sweating is our air coolant system, keeping us from overheating. By regulating body heat, our sweat gland system is our ticket to normal body temperature. The millions of sweat glands and ducts that are studded throughout our skin are there for a very important reason: to keep us comfortable and, by perspiring, keep us from expiring.

The sweat gland itself is complex and found at virtually all skin sites. We all know from personal experience that sweat glands are most common on the palms, soles, forehead, and armpits. But why do some of us seem to sweat buckets while others look dewy fresh on the hottest of days? How much you sweat is dependent on the nerve fibers that supply the sweat glands. These fibers, called *cholinergic fibers*, respond primarily to heat. Emotional stress can be an important factor as well, highlighting the close connection between your mind and your skin.

■ SCENT, AROMA, OR SMELL? AGAIN, IT ALL DEPENDS

Ironically, the gland in the skin that is probably the least understood may have the greatest impact on our social interactions. The *apocrine* (pronounced AP-o-krin) glands secrete a fluid that contains protein, carbohydrate, ammonia, fats, and iron. This secretion is milky and odorless until it reaches the skin surface. There, bacteria interact with it to create a unique scent, one that varies from individual to individual.

In most cases, this scent is either unnoticeable or mild. In some people, because of the nature of their secretion and the bacteria that live on

their skin, a foul smell can develop. This condition, called bromhidrosis, can be controlled to some degree with antibiotics.

Apocrine secretion is affected by the nervous system, particularly chemicals like adrenaline that circulate throughout the body. In animals, apocrine glands have a protective and sexual function. The most common sites of these glands in people are the armpits, the nipples, and the anal area.

Pheromones are the scent molecules produced by animals that serve a role in sexual attraction. Since skin is our largest erogenous organ, it makes sense that it should bear fibers for touch and glands to attract those who touch, though we are not yet certain of the role of pheromones in humans.



Hair follicle and spiral sweat gland growing in skin

▪ HAIR TODAY, HOPEFULLY NOT GONE TOMORROW

Hair—and I don't mean the Broadway musical—reminds us from where we came and who our relatives are. Whether we are fair-skinned with light hair or darkly pigmented with thick curly hair, each of us is covered with hair follicles.

Fur is one of the distinguishing features of mammals. Through evolution human beings have lost the thick pelage that characterize other mammals and even birds, but the follicles remain. All you have to do is study a chicken's skin more closely the next time you're preparing dinner to see how similar our feathered friends are to us. Next time you have occasion to see a fish up close notice the difference.

In human life, hair is an extremely important social and sexual attractant. The desire to have—and retain—hair has been with us always, as proven by the number of ancient remedies for baldness. Ironically, even as we scramble to retain the hair on our head, some people are bothered by unwanted hair in other places (for instance, on the upper lip in women and on the back in men). And it's in hair removal, with the popularity of laser devices, that dermatologic science and technology have made large strides. Laser hair removal isn't yet perfect, but it is an important step in the right direction.

Wanted or unwanted, hair remains a fascinating part of the structure of skin. Each hair grows from a follicle, which generally develops at an

angle to the skin surface (think fur). At its base is the hair bulb, from which the hair itself actually grows. On one side of the hair follicle is a sebaceous gland, which produces oils (think duck) that lubricate the hair and the skin as well. Attached to the other side of each follicle is something called the erector pili muscle (think shivering).

The actual hair shaft develops from the very active cells that are in the center portion of the hair bulb. The sheaths and contained hair are derived from different parts of the hair bulb and form concentric cylindrical layers. Think of a telescoping radio antenna and you'll have a sense of what it's like when the hair sheath grows and moves outward toward the surface of the skin. The epidermis that surrounds the hair follicle is a potential source of new keratinocytes. For this reason, patients with third-degree burns, in whom the hair follicles are destroyed, cannot regenerate epidermis. In burns that are not as deep epidermis can regrow.

The speed of hair growth depends on how fast the cells of the hair bulb divide. Interestingly, the shape of hair varies racially. The scalp hair of Caucasians is round while their pubic hair, beard hair, and eyelashes tend to be oval in cross section. The scalp hair of blacks is also oval but its curliness is due to the curvature of the follicle just above the bulb.

Hair color is due to the distribution of pigment granules within hair bulb cells, which become the cells of the hair shaft. The intensity of color is probably due to the number of fully developed granules produced by the melanocytes of the hair. Hair turns gray when a decreasing number of melanocytes produce fewer melanosomes.

While it is true that human hair growth is cyclical (when your dog sheds isn't it fall?), each follicle functions independently. Hair follicles operate in a fashion best described as hurry up and wait. There are stages of activity and stages of peace and quiet. During the growing phase, or *anagen*, the cells of the hair bulbs are dividing rapidly to produce the growing hair. As the division of these cells slows down the follicle goes into *catagen*, a transitional phase, where the cells stop dividing and the hair shaft develops a clublike appearance. During the final resting phase of the cycle, called *telogen*, the follicle gets ready for new hair to grow. The newly formed hair dislodges the club hair that was present during the previous phase.

The average scalp hair grows for three or four years and the resting phase lasts for about three months. On average, 85 to 90 percent of all scalp hairs are in the anagen phase, but of course this figure gets much lower with age and decreases even faster in individuals who have male-pattern baldness. (For more information, see chapter 14, "Hair.")

▪ THE BASEMENT MEMBRANE ZONE

What keeps the epidermis attached to the dermis? Why doesn't our epidermis just slide off? Why do you get a scar when you cut yourself, but not when you scrape yourself superficially? The answers lie in the fascinating structure where the epidermis meets the dermis, an area that is visible only under the electron microscope. Special attachment plates are identified in the so-called basement membrane zone where the epidermis comes in contact with the dermis.

The basement membrane zone is considered a porous filter; it permits exchange of cells and fluids between the epidermis and dermis. The most important thing to note, however, is that scarring will only occur if the dermal-epidermal junction has been damaged. A simple injury in which just the epidermis is scraped off but in which the basement membrane zone is not harmed will not result in a scar; on the other hand, any incision that traverses or violates this junction will most certainly result in some sort of scar. The extent of the scar depends on the wound care and the nature and location of the injury. Cosmetic claims notwithstanding, it is impossible to cut through the skin at this level without getting a scar. The question for the person having cosmetic or reconstructive surgery is not whether there will be a scar but whether that scar will be noticeable. Hiding the scar and helping it fade as much as possible are all in the province of wound healing and the techniques of dermatologic and plastic surgery.

▪ FINALLY, FAT

The subcutis is the third layer of the skin. Also known as the panniculus, it consists of fat cells, or lipocytes, separated by bands of collagen or fibrous strands. It is these fat cells that have made liposuction so popular since it is in this layer of skin that unwanted fat accumulates so easily (see chapter 16, "Liposuction").

Subcutis is a reservoir of energy for the body. It is both the tissue that shapes us into who we are (but might not want to be!) and an important source of insulation.

No aspect of the subcutis has received more attention than that called *cellulite*. Cellulite is not a formally accepted medical term, nor is it a distinct anatomic structure or abnormality. Cellulite refers to the puckered appear-

ance of the skin, usually on the thighs in women. This puckered appearance is thought to result from the fibrous bands that divide the lobules of fat and extend from the base of the subcutis to the top of the skin, pulling down like an upholsterer's button does on the back of your sofa or favorite chair.

I know of no cream, pill or procedure, wild claims notwithstanding, that will eliminate cellulite. Enough said. That doesn't mean that progress will not be made in understanding the anatomy of this tissue, allowing us to do so in the future.

Suffice it to say that beneath the subcutis is usually muscle, bone or cartilage. For all practical purposes this book will not go further than where the subcutis ends.