HOLISTIC ANATOMY

AN INTEGRATIVE GUIDE TO THE HUMAN BODY

PIP WALLER

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"Open this book anywhere and read a paragraph; you'll want to read more. Keep reading- You'll enjoy yourself while finding out about the human body. You will also get a glimps here and there from an unexpected perspective!"

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"I would wholeheartedly recommend this book to anyone who is even vaguely intrigued b the 'how' and 'why'—and more importantly, the 'what if'—of their existence …"

—KAREN CHAGOURI, editor of *In Touch* magazin
holistic therapist, and dou

"This book is written in a style that is very easily understood, instead of just being factu information. It feels as though Pip is there with you explaining things to you in a way th really makes sense."

—PHIL PEPIN, massage therapi

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This book is dedicated with great love to Alex, the apple of my eye,
and to all my students over the years who taught me
so much and inspired me to write this book.

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Author's Note: This is not a conventional textbook—it roams around through all kinds o subjects, weaving them into anatomy, physiology, and pathology. If you are studying a cours of some kind, you will still need your recommended books. This is meant more as a appetizer to get you going.

Medical Disclaimer: The following information is intended for general informatio purposes only. Individuals should always see their healthcare provider before administerin any suggestions made in this book. Any application of the material set forth in the followin pages is at the reader's discretion and is his or her sole responsibility.

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Introduction

In a sea of anatomy and physiology books, why write another? Mainly to help contradi the notion that anatomy and physiology are dry and boring, and to share more widely m particular style of introducing adults to the miracle of the body, Spirit made flesh, with th many opportunities of philosophizing, chewing the breeze, enjoying the appare ridiculousness, and otherwise observing how to live well, that this subject abundantly offers

I will assume that you have very little knowledge, and begin by introducing the body ver simply and building on this knowledge to add layers of understanding. The goal is to leav the reader truly understanding something of how the living body works, rather than to cov every detail of current knowledge on anatomy, physiology, and pathology. It seems th many people study A & P to considerable depth—even managing to pass detailed exams o the subject—without ever gaining a real understanding. This book aims to remedy that.

I will attempt here a holistic—and in places more than slightly heretical—anatomy an physiology: that is, an exploration of the mechanisms of action of the body mixed wi interesting thinking about emerging sciences such as quantum physics and the new biolog human emotional anatomy, ecological principles, and spiritual and energetic paradigms. Yo will see that the study of human biology can be linked to broader considerations of how human exists within, and interacts with, the environment, and experiences existence emotional and spiritual, as well as physical, terms. Some of what follows is accepte scientific fact, some challenges such facts, and some is just my own ideas and philosophies based on both my own and borrowed observations. I will conclude with a brief overview o various paradigms of health and disease, including beginning a discussion of what tot healing of body, mind, spirit, and global society could mean. I am very familiar with som forms of natural medicine; these are the ones I mention most as examples. The absence o mention of other systems in no way indicates their lack of value—only my own lack o knowledge. I hope that students of these disciplines will forgive this lack and still find th book helpful as an aid to understanding the medical sciences.

As this is *not* intended to be an academic work, I provide almost entirely secondar references, intending where I can to point the reader on to further study. At times I repe information to aid the learning process. (After all, the main way humans learn is b repetition, repetition, repetition.) You can take it all with a large pinch of salt (after all, ou bodies are swimming in salt water), and enjoy the mental meandering, which will help you remember the plain facts. Actually, I advise you to be vigilant against adopting a fixe position—keep thinking for yourself, and rather than getting attached to one viewpoint, hav an open mind and be prepared to adapt your thinking as new information emerges. Moder orthodox medicine offers many examples of what happens when you don't do this. Tak antidepressants, for example: In early March 2008, the headlines were full of how they on work for thirty percent of people. But did you know that the entire premise that depresse people have low levels of serotonin in their brains, first theorized in 1967, has never actuall been proved, despite many attempts to do so? This theory has been accepted by man medics, including those in the mental health field, and is widely believed publicly, yet seems very likely to be wrong![1]

The actual physiology herein is at a fairly basic level, without being oversimplified. I places it is more technical than the interested lay reader or healer would need (or like); thes readers can skip over the bits that are too detailed and stick to taking in the juicy bit Students who are required to go deeper will gain a practical understanding of how the boc works and then return to their more in-depth textbooks with renewed vigor.

The human being, in body, mind, and spirit, is a beautiful and complex entity—there always more to be learned. In this spirit, I have included some contradictory ideas that cou all be true. I would be very pleased to hear from you with new ideas, information th debunks my own ideas, and any other feedback that adds to understanding our bodies, mind and existence in this way.

Please contact me via the book's Web site, www.holisticanatomy.com.

This book is intended for:

- Anyone studying, or with an interest in, holistic medicine, particularly those with le than 100 percent enthusiasm for the anatomy and physiology side of things. This boc will light your fire!
- People who want to know more about how their body works but don't want to read straight textbook.
- Those who enjoy science, but feel it can be a little disjointed.
- Healers and energy workers who need to bone up on how Spirit looks when it's in th flesh.
- Anyone with a body and a thirst for knowledge about it, who likes to look at li sideways.

SECTION 1

How the Body Works

This section deals with the anatomy and physiology of the body—how the body works, starting with an overview, and then looking at the microstructure and all of the various body systems.

An Orientation to the Human Body

First, some basic anatomical language, and a general orientation.

Just as the universe is a gigantic dance of stars and planets, spinning and turning mysterious space, so the human body is an incredibly beautiful and complex creation, wi millions upon millions of cells, functioning in their different ways to make an integrate whole. (Just thinking about the word "cell," I realized it kind of sums up the separatis mechanistic approach to life of Newtonian science, which gave birth to modern medicin which is brilliant in its way, yet lacking in connectedness between the different bits of th body; between the body, mind, and spirit; between a person and the environment.)

Groups of similar cells are found joined together to form tissues. Different tissues togeth form structures with specific functions, called organs. Organs are associated with variou tubes and supporting structures in things called systems. These carry out types of work in th body, like the different departments in a company or the various goings on in a communit communication, control, energy input, waste disposal, transport, production, and so on.

The body exists in a state of constant change and movement. There is an internal balanc known as **homeostasis**, which is constantly monitored and maintained. This is the Weste way of explaining what the Chinese call yin and yang: the complementary opposites that life are always moving and dancing together in and out of balance. (In Western physiolog homeostasis relates to physical functions only.)

In life there is no stasis—all is continually moving and changing. The chemicals in the boc are kept at optimum levels. They move up and down these levels, and by so doing keep ou bodies functioning well.

For the purposes of study (and following Western scientific tradition, which loves separate in order to analyze and classify), we divide the functioning of the body into systen and look at each one individually: the skin; the skeleton; joints and muscles; the heart an circulation; the circulation's companion, the lymphatic system; the lungs; the gut; the kidne and bladder; the nervous system and the special senses; and the reproductive system.

Remember, however, that the parts cannot and do not function alone—all are connecte together in their intricate dance to maintain homeostasis. Even though each cell has i individual life and functions, there is an overall coherence. The endocrine and nervou systems are key in this, but not the end of the story; there seems to be an intelligence th runs through the body and mind, connecting and somehow orchestrating it all, which goe beyond what is currently understood by science.[1]

Connected to Each Other and to All Life …

We humans also cannot—and do not—function alone. Our modern world allows the illusio of separateness. I can live in my house, go to work in my car, sit at my desk and work, bu

food to cook alone or with my small immediate family, with very little contact with oth humans. Recent political trends in Britain positively promoted this idea, with the philosoph "there is no such thing as society—there are only individuals."

The reality is, we are not independent. We are absolutely and completely dependent o each other (interdependent) for our survival, just as we have been since the beginning time, and just as our cells are dependent on each other for the survival of our body.

Long ago (about three and a half billion years) our ancestors were still in simple chemic form hanging out in the primordial soup, when they noticed that if they hung out togeth they did better at surviving. Hence the first creatures formed, who then noticed (about billion years ago) that getting together with each other created yet more opportunities f multiplying. We still carry within our cells **mitochondria**, which were once smaller cel **(bacteria)** that became part of a bigger cell—were swallowed by it, or invaded it. Th partnership was successful for both parties and survived to be the building block of ou bodies, the modern **cell.***

In the morning, an alarm clock made in a factory across the sea wakes me. I get up an dress in clothes made somewhere else. I eat food grown by people of many countries- packed, transported, and sold to me. Before I even leave the house in the morning I hav been touched by thousands of other lives. It is impossible for a human being to be separat We are connected to each other and to all life, to the earth we live on, as intimately as ou cells are part of us. Likewise in creating this holistic anatomy, physiology, and patholog book, I am roaming through body, culture, society, Earth, politics, healing, and spirituality.

Anatomy and Physiology: Structure and Function

The word **anatomy**, from Greek for "cutting away," refers to the study of *structure:* wh does it look like, where is it, how is it put together? The word came from the process autopsy (cutting up dead bodies), through which much of anatomical knowledge arose. Th may account for some of the weaknesses of Western medicine—study of dead bodies cann give us entirely reliable information about living anatomy.

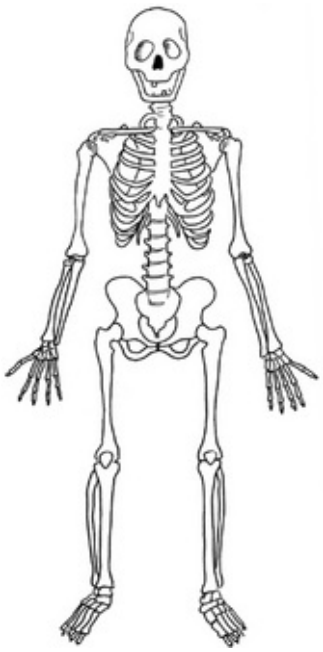

FIGURE 1.1. The human skeleton

Take a look at the pictures of the skeleton in any anatomy book (including this one!). Se how big a gap there is between the top of the ilium (hipbone) and the bottom rib. Now hav a feel of your own body; see how much space there is between these two bones. You'll fin it's considerably less. This is due to the way the skeleton is held and pulled on by th muscles, which makes it different in life and in death. This is not meant as a criticism o traditional anatomical study—but it is important to be aware, as we attempt a study of livin anatomy, of the basis of much of this knowledge.

Physiology is the study of life, or *function:* what does it do, and how does it do it? Most o the knowledge modern physiology has gleaned has come from countless experiments o animals.

Anatomy and physiology naturally go together. We say there is a *complementarity* o *structure and function*—for example, blood flows in one direction; in the veins it flows towar the heart (physiology) because of the one-way valves (anatomy).

Pathology is the study of what can go wrong: *disease*. (Which means "disease," a lack o easy functioning.) There are many different approaches here. This book will introduce som very basic Western pathology, which is extremely good at describing what is happening in th tissues during disease states. We will also briefly explore various holistic models of the cause of disease.

A Hierarchy of Organizational Levels

There is said to be a hierarchy of **organizational levels** in the body. We love to make pyramid out of a circle! Here they are:

The simplest level is **chemical**. Everything is made of atoms,* combining to for molecules, which combine to form organelles … and so on. There is much more on this t come—brace yourselves!

Next comes **the cell**, bound by a highly intelligent, semipermeable membrane an containing fluid called cytoplasm. All cells have some common functions, but there enormous variation between different cells in the body. Inside the cytoplasm are four organelles, which carry out the basic functions of the cell—including the mitochondri nucleus, Golgi body, and endoplasmic reticulum.

Cells and so-called extracellular material (stuff that cells make, is not a cell, and is four outside a cell, such as collagen fibers) get together to form **tissues**. There are four bas types: the lining **epithelial** tissue; **muscle** tissue for movement; **nervous** tissue fo communication and control; and **connective** tissue for … connecting. The four tissue type are arranged in various ways in the body, forming its organs, tubes, and supportin structures.

Organs are discrete structures carrying out particular functions. There are many organs i the body, including the heart, lungs, brain, liver, gall bladder, pancreas, kidneys, bladder, an uterus. They are made up from all the different tissue types. Hollow organs, such as th heart, have an inner lining of epithelial tissue, a middle layer of muscle, and an oute covering of connective tissue. The tubes in the body, such as the blood and lymph vessel

ureters, fallopian tubes, windpipes, and gastrointestinal tract, have the same basic structur an inner lining of epithelial tissue, a middle layer of smooth muscle, and an outer covering connective tissue.

Organs and supporting structures, like the tubes of the gut and blood vessels, get togeth to perform whole areas of function in the body, and these are known as **systems**. Systen carry out the functions necessary for life, e.g., the heart and blood vessels make up th cardiovascular system, responsible for transport throughout the body. All the systems wo together.

The whole thing is called the **organism**. It's good to remember that, although we break down into separate parts for study, actually the organism (us!) is a complex being in whic all parts work together harmoniously. The maintenance of harmony and balance within th organism is known in Western physiology as **homeostasis** (although this relates only to th body). Uniquely in world cultures, modern Western science does not recognize the existen of Spirit, and is just barely beginning to understand the Mind.

Can you see yourself as part of a highly ordered world—universe, even—with its ow control systems and homeostatic balancing mechanisms? This seems far-fetched to mode Westerners, brought up with a purely mechanistic view of the world on top of the Jude Christian paradigm of the world being put here for the use of humans, but it is A-B-C (rock, tree, stone!) to many tribal people living in close harmony with the earth. How wou it change things for you to consider yourself related to all, to remember every bacteria your close kin, to know the rightness not only of *your* existence as a beloved child of th universe, but of every single other, whether human, creature, plant, or rock? This is how th remaining tribal peoples of the earth—keepers of the Old Ways—live.

Water, Water Everywhere …

The human body, like the surface of the earth, is sixty to seventy percent water. This water found all over the place: inside cells (where it is called **intracellular fluid** or **cytoplasm** and outside cells **(extracellular fluid)**. Extracellular fluid (outside of cells) is found both and out of the tissue spaces. In the tissue spaces it is called tissue fluid or **interstitial flui** and this bathes every cell in the body. There is a kind of glue here that holds the cel together and makes a gel of the tissue fluid, called **hyaluronic acid**. There is als extracellular fluid that is *not* found in the tissue spaces; this includes the blood plasm lymph, and cerebrospinal fluid.

Some bacteria and viruses make an enzyme called hyaluronidase, which breaks down th glue to allow them to move around more freely. The well-known plant Echinacea "antihyaluronidase"—it can halt the spread through the body of invading organisms b preventing them from ungluing our tissue fluid. Research has found that Echinacea (*Purpur* and *Angustfolia* are the active species) also increases phagocytosis of foreign matter by whi blood cells, increases lymphokines and cytokines that stimulate immune function, is antivir at least externally (in vitro), is anti-inflammatory and yet improves wound healing, and ha some antimicrobial activity.[2]

The Necessary Functions for Life

Maintaining boundaries is done by the skin, and on the cellular level by the selectivel permeable membrane of each cell. In Chinese medicine, there is the Wei level—a protectiv energy that circulates along the meridians at the most superficial level. All energy healir systems have a way to describe a protective energy around the body.

Movement. In animals, muscle tissue allows for movement in the body—not just of ou whole body by the skeletal muscles, but also in the digestive tract and the cardiovascula urinary, and reproductive systems. Interestingly, plants move too, albeit much more slowl than we do. Many grow toward the light and will move as the light moves. Some catc insects, and many have ways to move their seeds across huge distances. Even whol populations can move, in response to changing conditions. For example, with global warmir causing increased dryness in the South of England, beech woods are threatened ther However, they are now growing farther north than ever before, so in time, the entire fore will move north.[3]

Responsiveness is the ability to sense changes and react to them. All cells are responsiv but the nerve cells are particularly so and this is what allows them to carry out the functions of communication and control of body activities. Responsiveness is also calle irritability—nice to know it's an essential life function to be cranky!

Digestion is the breaking down of food into usable parts.

Metabolism actually means all chemical reactions occurring within cells—breaking thing down (catabolism) and building things up (anabolism). This is how we get energy.

Excretion is getting rid of the leftovers, the toxins, and the stuff we can't use.

Reproduction. Some say this is what it's all about! On a cellular level it happens daily a many cells continuously reproduce themselves, and are replicated to replace old worn-ou ones. Then there is the more challenging task at the organism level, where whole ne organisms are made.

Growth refers to the increase in size, as well as number, of cells within the organism Many cells start off simple and grow in complexity, changing their makeup as they develop For example, blood cells all come from one great-grandmother cell that divides an differentiates to become the very different red and white blood cells and platelets. There also growth outside of cells, as structures such as hair are built up, and fibers are made (connective tissue, for example).

Body Cavities and Organ Location

The skeleton makes areas of bony protection for squishy internal organs to hide within: th cranium of the skull protects the brain, and the vertebral column protects the spinal cord as passes down that bony canal. The chest cavity, or thorax, protects the heart and lungs, an the pelvic cavity protects the bladder and **gonads** (sex glands) or ovaries, in women. (Men gonads, the testicles, as you are no doubt aware, reside outside of the abdominal or pelv cavity.) The thorax is divided from the abdomen by the **diaphragm** muscle, which domes u from the bottom of the ribs to a central flat tendon.

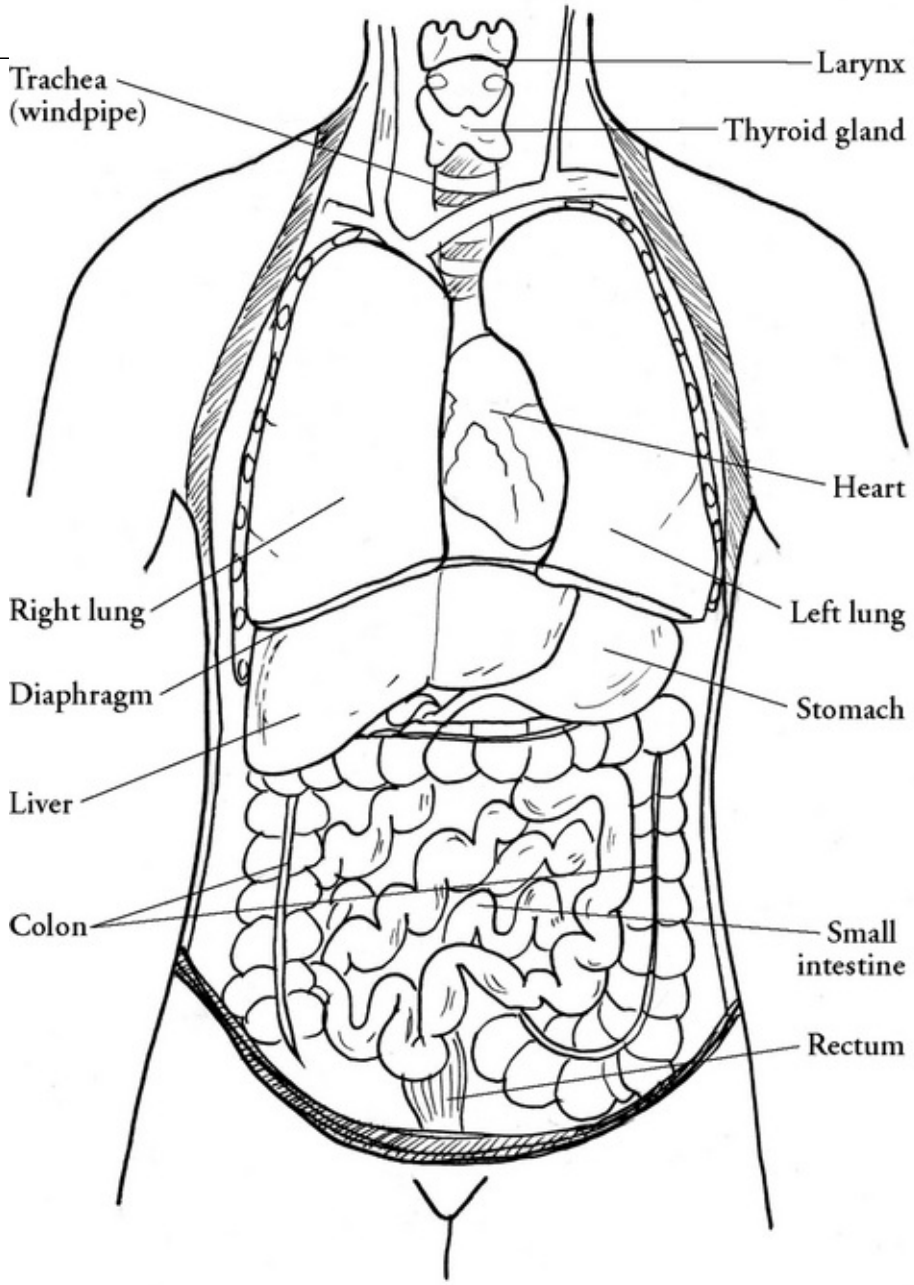

FIGURE 1.2. Location of organs

Beneath the diaphragm, the ribs protect the upper part of the abdominal cavity, and he nestle the kidneys, liver, and spleen. The two kidneys are found on either side at the back— you put your hands back there on the bottom few ribs, you are directly over your kidney The liver takes up the rest of the right side, front and back, with the gall bladder attache below it. The spleen is found toward the back on the left. The muscles of the abdomen at th front and sides, and the spine and back muscles at the back, protect the less vulnerable gut or intestines. The lower part of the abdominal cavity is the pelvic cavity, containing th reproductive organs and the bladder.

An Overview of the Body Systems

Just take a moment to be aware of your body—your bones and muscles supporting yo

holding you up, turning the page, scratching your head. There's probably an ache here ar there, drawing your attention to particular muscles. In fact, we often have the habit noticing our bodies most when they are giving us trouble.

Find a friend and put your head on his or her chest—you can hear the "lub dub" of th heart beating. Feel your friend's pulse: put a couple of fingers inside the wrist on the thum side, just outside the big tendon you can feel there. This is the radial pulse—a surge movement in the blood vessels as blood is pumped around the body. Listen to the heart ar feel the pulse at the same time; you'll hear the heart beat, then right afterwards, feel th pulse as the heart and blood vessels work in concert with each other. This **cardiovascula system** is the means by which things are transported through the body. Nutrients, was products, hormones, and, in traditional Chinese medicine, chi energy—all rely on th circulation to get around.

The circulatory system is backed up by the **lymphatic system**, a collection of tubes calle lymph vessels that begin in the tissues and, like the veins, drain waste products and wate This lymph fluid is filtered and cleaned by lymph nodes, and eventually returned to th blood. The lymphatic system is also heavily involved in **immunity**, protecting the body fro outside organisms, cleaning up toxins, and destroying abnormal cells.

Focus on your breathing for a few moments. Can you feel your thorax (chest) expandi front and back, sides, top, and bottom? Place your hands on each side of your upper ches with the fingertips touching your collarbone, and your elbows held in to your sides. This the location of your lungs—are they smaller than you thought? The lungs are one of the mo delicate organs in our bodies, part of the **respiratory system**, a series of pipes ending in tin air sacs, or alveoli, that are surrounded by a network of minute blood vessels. Oxygen passed from the alveoli into the blood, and carbon dioxide is passed from the blood into th alveoli to be breathed out.

The oxygen is used by your cells to burn sugar and fat to make energy. (See Chapter 2 We've seen that the respiratory system is how we get the oxygen into the body. What abo the sugar and fats? Put your head on your friend's belly and listen. Within moments, you w hear gurgles and pops, signs that the **digestive system** is working to break down food in small, usable parts. When they are small enough, these molecules that made up the food a absorbed into the blood stream. What we don't need is left inside the gastrointestinal tract be excreted.

Go and take a drink—a large glass of water. What will happen to this water? First, it w cross the gut wall and enter the blood. If allowed to stay in the blood indefinitely, the bloo pressure would go up, and the blood would become too diluted. We need to keep the rig amount of water in our body all the time. This process is controlled by hormones—chemic messengers—and by the brain. The brain also controls hormone secretion, e.g., antidiuret hormone is produced by special neurosecretory cells. Hormones from the kidney, heart, ar brain control water balance, and the brain controls thirst. We can either preserve wate keeping it inside our body, or bail it out when there is too much. We bail it out using ou **kidneys**. These amazing organs filter the blood and produce varying amounts of urine. A well as water, this contains the nitrogen from old worn-out proteins in the form of ure along with other waste products and excesses. Every minute, the kidneys filter 125 ml blood, which means that an amount of blood equivalent to all the blood in the body pass

through the kidneys in less than an hour.

Hormones are a kind of homemade drugs, crucial to the way the body communicates wi itself and controls its activities. They are made in specialized places called endocrine gland which anatomists mapped out in the nineteenth century, and in various other organs, tissue and cells all over the body. They are secreted directly into the bloodstream, so they trav everywhere. The **endocrine glands** are the pineal and pituitary in the head; the thyroi positioned like a bow tie around your neck; the thymus, found behind your breastbone; tw adrenal glands, one on top of each kidney; the gonads or sex glands; and the Islets Langerhans in the pancreas, making insulin. The Islets of Langerhans are not, strict speaking, an endocrine gland but are one of the other cells and tissues making hormone these include, among others, the heart, liver, kidneys, stomach, and fat cells.

The endocrine system doesn't do all of the communicating and controlling. It is assisted b the **nervous system**—the brain, spinal cord, and nerves. This system runs its wires all ov the body. Close your eyes and wiggle your fingers. What are you *doing?* Your brain is telli your fingers to wiggle—this is the motor nervous system. How do you know you are doi it? Because of your sensory nervous system you can *feel* it. That's basically it—your senso nerves gather information and feed it to the brain, which decides what to do, and the mot nerves carry out those decisions by telling your muscles to contract or your glands to secret Simple!

More on Homeostasis

As I said earlier, in Western physiology, the word homeostasis relates purely to physic functions, especially the control of temperature, blood sugar, and body fluids. The intern organs require a fairly constant temperature for optimum functioning. When the environme is cold, we maintain heat by the blood vessels in the skin constricting (thus we look pale) a by shivering—much of our body's heat is generated by muscles contracting, so shivering is a involuntary way of getting us moving. The heat is transported around the body by the bloo rather like central heating. When we are hot, our skin reddens as the blood vessels in dilate, allowing heat to leave the body. Also we sweat, which cools us because some of th heat energy in the skin is dissipated, making the sweat evaporate.

For everything to work well, we need the right amount of water in our bodies—too muc or too little can cause problems and eventually kill us. Fluid balance is maintained by th kidneys, which filter the blood for nitrogenous wastes (toxic to us, food for plants) a excrete this, along with varying amounts of water, through the tubes of the ureters, into th bladder and out of the body through the urethra.

Most of the energy we need in the body comes from the sugar called glucose; we dige food and absorb its molecules into the blood. We need different amounts of glucos depending on our activity—less at rest, much more during exercise (or intense thinking suc as you are doing now). The sugar in the blood gets into the interstitial fluid, and the cel take what they need. The right amounts in the blood are maintained by careful storing excess glucose (as glycogen by the liver and as fat), or releasing of these stores. The proce is controlled by the endocrine and nervous systems using a **negative feedback mechanis** This basically means that as something rises in the body, whatever caused it to rise will the

be decreased. For example, eating food causes your blood glucose to rise, which will als decrease feelings of hunger—although, of course, we can usually manage to enjoy chocola anyway by disregarding this!

More Negative Feedback

In the world of physiology, negative feedback means that when *rising* levels of a certain thi (say, heat or glucose) are detected by the body (specifically, by some kind of nerve receptor that information is sent to a control center (usually in the brain), which then sends command to put something into motion to *decrease* that thing. If it's heat, for example, th commands will be to make the skin flush and to sweat in order to lose heat. If it's glucos this may be taken from the blood by putting more of it into the cells, and transforming mo to its stored form, glycogen.

It's rather like the thermostat in a house: If it is set at 18°C (65°F), when the temperatu rises above this, the heating is switched off automatically. If the temperature goes below th set level, the heating is switched on, thus maintaining a constant temperature.

There are a few things in the body that work by physiological positive feedback, whic basically means the more there is of something, the more it is stimulated. Childbirth happe like this, with oxytocin (a hormone from the pituitary) causing the uterus to contract, a this then causing more oxytocin to be released in a cascade, leading to birth. Another examp is blood clotting, when a clot beginning to form actually causes more blood to clot. Mayb love works in a positive feedback kind of way too—the more there is, the more there will b

*It turns out that bacteria often behave in a way that turns the Darwinian "survival of the fittest" paradigm on its head. N only do they not compete with each other, bacteria actively cooperate, exchanging important information about th environment (this is why they so quickly become immune to antibiotics, even those who haven't themselves been exposed a particular antibiotic). These distant ancestors of ours are masters of adapting to their environment. (See Stephen Buhner's *The Lost Language of Plants*.) Actually, fifty years before Darwin, the man who first put forward the theory evolution, Jean-Baptiste de Lamarck, emphasized the "instructive" cooperation between organisms and their environme (See Bruce H. Lipton, *The Biology of Belief*.)

There are ancient bacteria that do look quite similar to mitochondria—but let's remember that this can only ever remain theory. We do need to be careful to not just pick the evidence we like to fit the story we like. Rather, the story should for around the unbiased facts, and we should be willing to change the story if necessary. Consider the creationists: They like th story and so only listen to evidence that supports it, and dismiss evidence to the contrary.

*Atoms are made of "subatomic particles" that, according to modern quantum physics theory, are pretty much nothing b some kind of mysterious energy. They are made of energy—incredibly fast moving vortexes of photons and quarks that, wh you look really closely, disappear! (See Heinz R. Pagels, *The Cosmic Code: Quantum Physics as the Language of Nature*.)

The Chemistry of Life

The life of the body all starts with the fusion of two cells to make one—the tiny zygote fro which all of the amazing cells, tissues, organs, and systems of our brilliant bodies grow. Or it sex it all starts with? The egg, or the chicken? We'll save sex for later, sprinkling it abo here and there to spice up our anatomy life.

Actually, when you get down to it, it's about *chemistry*. Groans often ensue when peop hear this word. But chemistry is just the language of the physical world. Chemistry is abo how energy arranges itself to form matter. An endless dance of atoms, forming and reformi molecules, which get together with other molecules, which get together with still oth molecules, to make … everything! Here is where modern Western science a mystical/religious/shamanic/energetic traditions agree.

Everything That Exists Is Made of Energy

What is energy? It's a word we apply in all sorts of ways—oomph, zest, life force, physic energy, mental energy, emotional energy, spiritual energy, kinetic energy, chi, agni, pran pneuma, nuclear energy. It is the stuff that allows other stuff to happen.

In Western science, the definition is narrower: Energy is defined as the capacity of a syste to do work, and is measurable by instruments. This definition of Newtonian orig (seventeenth century) really came into its own in the nineteenth century, the Industrial Ag and perfectly reflects the work ethic of that time.

Interestingly, in the last fifty years, science has also realized that energy is the stuff th drives the universe, drives every event in the universe, and is in fact the basic constituent the universe. Although it can be measured and quantified, we have no real idea what actually is. Physics finds that energy is the most fundamental property of the univers everything can be created by or dissolved into energy, including matter itself.[1] There is background buzz of energy everywhere—the so-called zero point field.[2] More on this later.

Consider Einstein's famous equation $E = mc^2$ (energy is equal to matter times spe squared, or the speed of light in a vacuum, which is a constant). It kind of means, energ cannot be destroyed, only move or change from one form to another. The movements a changes in energy are produced by forces, such as by the push and pull of electrical force, a the pull of gravity, which is produced by all the local matter being attracted to all other loc matter. We experience this by being attracted to, or pulled, to the earth.

(To do the great Albert Einstein justice, he in no way saw the universe as empty a mechanistic. To quote him: "The most beautiful and most profound emotion we ca experience is the sensation of the mystical. It is the power of all true science. He to who this emotion is a stranger, who can no longer wonder and stand rapt in awe, is as good dead.")

Ancient spiritual systems throughout the world—including Vedic knowledge in Indi shamanism or Earth-medicine (of which all tribal peoples have a version), and spiritu healing methods—all agree with modern physics on this business of energy being everythin but give it a different slant. Everything that exists is made of energy, including us. Because this, we can communicate with everything—there is a place within us that can experience an in a very subjective way understand and use this energy. This approach is not separable fro living in close harmony with what is all around us: nature. Vedic practice is about realizin one's true nature; realizing that one is pure consciousness, therefore knowing everythin having access to all knowledge from within. Shamanic practices using this principle inclu weather-working (affecting the weather by dedicated relationship with the weather gods remote viewing to find animals or plants needed for survival, and uncovering the causes illness.

The Hopi people have long understood the interconnectedness of life forms, warning that you kill off the prairie dogs there will be no one to cry for rain. Amused scientists, knowin that there was no conceivable relationship between prairie dogs and rain, recommended th extermination of all burrowing animals in some desert areas planted to rangelands in th 1950s in order to "protect the sparse desert grasses." Today the area (not far fro Chilchinbito, Arizona) has become a virtual wasteland (according to Bill Mollison *Permaculture: A Designer's Manual*). It turns out that all the burrowing animals, from gophe to spiders, create a network of tunnels under the earth that then allow the water deep with the earth to rise and escape as moisture-laden air that forms clouds and thus provides rai Stephen H. Buhner says in *The Lost Language of Plants: The Ecological Importance of Pla Medicines to Life on Earth* that "indigenous peoples have always had access to the finest prob ever conceived, one that makes scientific instruments coarse in comparison, one that a human beings in all places and times have had access to: the focused power of huma consciousness."

Of course, "subjective" is a bit of a dirty word in Western science, which prefers things be objective, to know how things are in and of themselves. However, more and more data emerging about the profound effect the experimenter has on the experiment (an experimer being something that looks for objective facts). Just the fact that someone is experiencing a experiment (subjective) can change the result that actually occurs (objective). Therefore truly objective result seems impossible.

Many people working in the field of holistic medicine consider that totally new researc paradigms are needed to properly research the field. Perhaps, in attempting to be total objective, we may be in danger of cutting ourselves off from the depth and power of ou subjectivity, and have it rule us by our ignorance of it.

Some of the energy that powers us humans, enabling us to think and move and learn an love and play and work, is **electricity**. Our cells are powered by electric fields, generated b the positive and negative charges of the particles within atoms, which drive currents protons through the tiny molecular machines within them. These positive and negativ charges are derived from the breakdown of glucose, the body's fuel of choice.

Everything is made of energy, but there are also these things called particles, which see to be there if you don't look too closely at them! We'll take a quick look at them now.

The smallest particles are tiny. Even atoms are made of very little actual stuff—energy tha

just whizzes about and acts solid. An atom has three types of particle: protons and neutron found together in the center of an atom to form a kind of nucleus, and electrons that wh around the nucleus.

An atom looks a bit like this. The balls in the center are protons and neutrons; th negatives orbiting around them are electrons. However, real atoms are mostly empty spac If we wanted to make an accurate drawing, we would have to draw the electrons about mile away!

In this drawing, it looks like the electrons neatly orbit the nucleus, when in fact they don' In reality, it is not possible to tell exactly where an electron is at a given moment or where is going. Scientists can calculate the probability that an electron will be found in a give volume of space, but that isn't the same as knowing where that electron is.

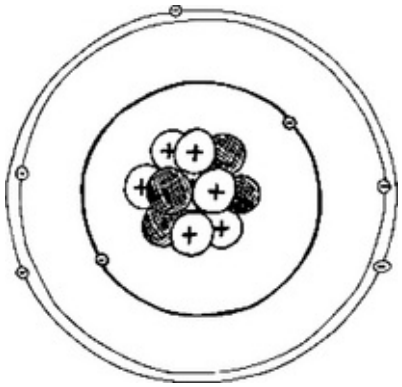

FIGURE 2.1. The Newtonian atom

Electrons, which have a negative electrical charge, are the smallest particles of matte Then there are neutrons and protons, being neutral and positive, respectively. The electron whiz around the proton and neutron center of each atom incredibly fast.

What feels solid to us is really not so solid on a particulate level. There are particles calle neutrinos that can move at speed straight through large solid objects—like the Earth—and o the other side without being changed at all. These particles form the basis of the universe ar modern physicists are discovering some really amazing stuff about them. For example, the appear and disappear *and no one knows where they go*. This is all to do with the zero poi field, so-called because physicists cool things down to absolute zero to study particles, makin them much slower moving. Another fascinating phenomenon is that if you completely isola two particles of the same type that are in relationship to each other (known as entrained) ar do something to one of them, its relative in the other isolation chamber behaves as if th same thing has just been done to it.

It looks as if quantum physics is beginning to catch up with the ancient shamanic wisdo of all cultures, and say, "Hmmm, the universe really is made of energy, everything connected, and human consciousness has the power to affect reality."[3]

Well, that's life—the universe and everything. Now back to atoms. Atoms get attracted other atoms, and then come together and share their outermost electrons—this makes what called a chemical bond. As soon as two or more atoms are bonded, we call the resulting thin a molecule. Some molecules are very small, for example, oxygen gas (O_2), which consists