THE SEX ATLAS

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NEW POPULAR REFERENCE EDITION
Revised and Expanded

ERWIN J. HAEBERLE, Ph. D., Ed. D.

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PREFACE TO THE NEW, REVISED AND EXPANDED EDITION

The great success of *The Sex Atlas,* both in the U.S. and abroad in foreign translations, has given me the welcome opportunity to prepare this revised and expanded edition.

Most of the text has stood the test of time very well, but in some instances substantial corrections and additions have seemed advisable. Especially, the sections dealing with venereal diseases, problematic sexual behavior, and sex therapy have been expanded and updated. Some chapters have been rearranged for easier comprehension. Furthermore, several new charts and illustrations have been added. Most importantly, the book's scholarly apparatus—bibliography, resource guide and index—has been completely overhauled. At the same time, however, care has been taken to preserve the original clarity and concentration on essentials.

In a book of this kind, there is always the danger of getting lost in distracting side issues and popular or professional fads. *The Sex Atlas* has, from the beginning, tried to resist this temptation. Nevertheless, it has proven to be the most comprehensive single volume in its field. In its present new form, it contains even more factual information and thus provides a very thorough and carefully organized introduction to the whole of sexology.

Although it has a long and honorable tradition, Americans are only now beginning to recognize the "science of sex" as a valid academic enterprise in its own right. *The Sex Atlas,* written as a sexological textbook, tries to further this recognition and offers the broadest perspective on human sexuality. Therefore, unlike other works on the subject, it does not restrict itself to clinical and therapeutic aspects, but takes note of historical, sociological, anthropological, and literary contributions.

By the same token, this book is also meant to be used as a general home-reference work. This new edition, with its strict systematic structure, non-technical language, handy size and large print, should reach an entirely new readership, including families who would otherwise be deprived of information they want and need.

In sum, I hope that *The Sex Atlas* will now be used not only in college classrooms, but also in many homes and libraries as a primary resource, much like a geographical atlas or dictionary. I believe it could make both the understanding of sex and communication about it much easier and thereby contribute to a more humane environment for all of us.

ERWIN J. HAEBERLE

ACKNOWLEDGMENTS

As I have explained in the introduction, the present book, as any textbook of this kind, is essentially a summary of work done by others. I therefore gladly discharge my duty of acknowledging my debt to those great scholars and scientists on whose writings I have relied in my effort. Their research, not my own, has provided the real substance of the following text. The most important of my sources have been the well-known publications of Alfred C. Kinsey and his associates and of Clellan S. Ford and Frank A. Beach, Lester A. Kirkendall, John Money, and William E. Masters and Virginia Johnson. In addition, I have made use of the work of several, hitherto untranslated, Middle-European cultural historians, especially Jos van Ussel *(Sexualunterdrückung,* Reinbek b. Hamburg 1970) and Annemarie and Werner Leibbrand *(Formen des Eros,* 2 vols., Freiburg Br./ München 1973). Of course, these and the many other original researchers to whom I am indebted are also repeatedly listed throughout the text, in the reference notes, and in the bibliography.

My own work of compiling, evaluating, and synthesizing the abundant source material has been immensely helped by several friends and colleagues without whom I would have lost my perspective. They have offered much useful advice and constructive criticism. I especially thank Professor Dr. Vincent J. DeFeo of the Department of Anatomy and Reproductive Biology, John A. Burns School of Medicine, University of Hawaii, Honolulu, who checked the first section of my book for basic accuracy and gave me a number of practical hints for its improvement. I have followed most of his suggestions. Any possibly remaining errors or omissions are, of course, my own. I am also deeply grateful to Professor Dr. Harvey L. Gochros of the School of Social Work, University of Hawaii, for his active interest in this project. His experienced eye focused mainly on the pedagogical aspect of my text, and from him I have learned a great deal about the effective presentation of research material in the classroom. He was also the first to call my attention to the problems of the sexually oppressed. My visits with him and his students have always been profitable and enlightening. I would further like to thank Professor Dr. Ronald J. Pion of the Department of Obstetrics and Gynecology, John A. Burns School of Medicine, University of Hawaii for some valuable material and information. In addition, I have received much-appreciated help and advice from Professor Dr. Charlotte Armster Gebhardt and Dr. Jerold Wikoff of the Department of German, Dartmouth College, from Professor Dr. Paul McCarthy of the Department of East Asian Languages, University of Minnesota, Minneapolis, and from Professor Dr. John R. Clarke, Department of the History of Art, Yale University. Special thanks are also due to Gene G. Bernal of the ESL program of the Modesto City Schools, Modesto, California, for his assistance at crucial moments and for organizing some of my often expansive files.

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ERWIN J. HAEBERLE

INTRODUCTION

This book offers a critical summary of current sexual knowledge. It is written for readers of any age who are interested in human sexuality and who want to know more about its history and social implications.

It can, of course, hardly be said that there is a lack of printed material on the subject. The list of pertinent publications already seems endless and is still growing. There are now so many studies, surveys, reports, guides, manuals, journals, newsletters, and magazine articles devoted to "sex" in all of its aspects that only a few full-time specialists can hope to keep track of them. Indeed, even these specialists have to specialize further if they want to remain up-to-date. Thus, most of them concentrate on selected areas of research, such as sexual anatomy, the physiology of sexual responses, reproduction and contraception, sex therapy, sex education, gender identity problems, sexual minorities, the history of sexual customs, sex legislation, erotic art, sexual ethics, etc. This special research is being conducted in many countries by countless individuals with a variety of goals and methods working from very different assumptions. The results are therefore often uncertain, contradictory, and confusing. Moreover, they are constantly being revised. Under the circumstances, many ordinary citizens may find it as hard as ever to be well informed and to reach any firm conclusions that could help them in their own lives. In the end they may come to feel that the more they read about sex, the less they know.

However, there is no need to give up and to leave the matter entirely to the "experts." We may still be very far from understanding human sexuality, but there are a few basic insights which are no longer disputed and which deserve to be shared as widely as possible. Especially in the United States recent research has produced a certain professional consensus on many formerly obscure and disputed issues, and this is already reflected in some of the newer textbooks, college courses, and educational television programs. In other words, while many areas of sex research remain controversial, it has now become possible to offer the general public a first integrated, if still somewhat limited view.

The Sex Atlas represents another attempt in this direction. It does not contain any fresh speculations or sensational findings. Nor does it want to scandalize, radicalize, or otherwise upset anyone. It deliberately refrains from presenting any research of its own. Instead, it merely repeats what has been said many times by the best contemporary scholars and scientists. In short, it is nothing more and nothing less than a piece of popularization. It is not trying to say anything new, but rather to state the well-known as clearly as possible in a coherent and methodical fashion.

This does not mean that the text is entirely factual and free of value judgments. On the contrary, even the casual reader will quickly discover that value judgments are openly expressed or at least implied in many parts of the book. After all, the very concept of research itself implies an attack on conventional wisdom and, if necessary, a breaking of taboos. No responsible sex researcher has ever pretended complete neutrality. A moral commitment is unavoidable whenever one deals with social issues, and, as everyone knows, sex can be and often is a source of intense human conflicts. To the extent, therefore, that sex research deals with these conflicts, it has always been forced to "take

sides" and to plead for some social change. From Havelock Ellis and Freud to Kinsey and Masters and Johnson, sex researchers have never hesitated to ask for new sexual values and attitudes. Any summary of their work would be incomplete if it did not reflect this concern.

On the other hand, *The Sex Atlas* does not try to record every interest or belief of every scientist who has ever studied sexual problems. Instead, the text is rather discriminating and selective. It gives preference to the most widely accepted current views and does not dwell on certain traditional arguments that have long proved to be unproductive. It further examines, wherever possible, the underlying assumptions of past and present research and tries to simplify the professional language. Thus, in many instances, the theories, theses, claims, and conclusions of a particular writer have been rephrased or translated from scientific jargon into plain English. Where esoteric or foreign expressions had to be retained, short definitions have been provided in brackets.

A special effort has also been made to be systematic, i.e. to organize the various bits of information into a unified whole and to present the reader with a practical frame of reference. *The Sex Atlas* therefore emphasizes certain important facts over and over again and repeatedly mentions the same historical personalities and historical dates. For the same reason, it also refers to the same classical authors and even the same great books in different chapters.

The text itself does not assume any prior knowledge on the reader's part, but begins "from scratch," as it were, building its case in successive stages and explaining every new piece of information as it is introduced. Therefore the book will be best appreciated by those who read it straight through from beginning to end. This procedure also recommends itself to teachers and students who use the work as a textbook.

However, the individual parts, chapters, sections, and paragraphs can also be studied separately, since they are firmly embedded in a larger framework. Frequent cross-references and the very structure of the book itself will quickly establish the appropriate context, and thus there is little danger of getting lost in meaningless details. The overall picture always remains clear. Again for the purpose of greater clarity, corresponding sections (such as those dealing with male and female anatomy or heterosexual and homosexual intercourse, for example) follow the same basic pattern and, where appropriate, even use identical language. This again makes for a certain amount of repetition, but it can also help in pointing out parallels that might otherwise be overlooked.

The fact that the discussion of the male here always precedes that of the female also reflects a didactic purpose. From a strictly biological point of view, it would perhaps make more sense to put the female sex first, but when it comes to practical problems, such as contraception, infertility, and sexual dysfunction, it is more useful to go against the current habits of thought and to begin with the male. In any case, it is hoped that the text will give many people a new appreciation of their sexual capacities and thus also help them to be more tolerant toward their fellow human beings. Accurate information can alleviate or even eliminate much of our present needless sexual misery.

THE HUMAN BODY

There are many ways of looking at the human body. We can admire it as the noblest of God's creations, despise it as the prison of the soul, worship it as the temple of love, fear it as the source of temptation, or study it as a scientific object. Only this much is certain: Whatever we see in it will reflect our own attitudes and intentions.

Most modern societies take a rather negative attitude toward the human body and especially toward its sexual functions. This manifests itself, for example, in the great moral concern about "indecent" clothing, "dirty" books and films, and sex education in public schools. In fact, there is a widespread conviction that the world is being inundated by a flood of sex and nudity which threatens the very foundations of our civilization.

However, our Western civilization, which is now several thousand years old, has not always worried about such problems. For the ancient Greeks and Romans, the nude human body was a familiar sight. Athletes practiced and performed in the nude at the gymnasium (Greek *gymnos:* nude). The participants at the original Olympic games (and at all other sports events) were nude. Public and private buildings were decorated with sculptures and paintings of nude men and women. The sexual aspect of nudity was openly recognized. Statues of certain deities, such as Hermes and Priapus, displayed an erect penis as the symbol of strength and fertility. Artistic representations of sex organs were worn in the form of jewelry as a good luck charm. The actors of the comic stage wore monstrous penises as part of their costume. In short, there was an open and joyful acceptance of the human body and human sexuality. The contrast to our modern world could hardly be more striking.

Many people today believe that the rise of Christianity is responsible for this unfortunate change. Indeed, some Christian writers are willing to concede as much to their secular critics. However, such a view is far too simplistic. Many supposedly Christian attitudes toward the human body are only a few hundred years old and would have been incomprehensible to the church of earlier ages. For example, the moral obsession with masturbation, or the notion that children are "innocent" and should be kept ignorant about sex, were all but unheard of before the 18th century. In the early 16th century, the great humanist Erasmus of Rotterdam was still able to write popular texts for children dealing with such topics as sexual intercourse before, in, and outside of marriage, pregnancy, birth, prostitution, aphrodisiacs, castration, and venereal disease (Erasmus, *Colloquia Familiaria*). A few hundred years later these texts were considered too outspoken even for adults.

The sense of shame or indignation at the sight of the nude human body which today pervades so much of our culture is also of relatively recent origin. In medieval Europe, nudity was not considered a moral issue. Families slept in the nude together in the same room, often in the same bed. Inns and hostels expected their guests to sleep together with strangers of both sexes. A

person refusing to share his bed or to take off his clothes would have been suspected of being diseased or disfigured. Public nudity was common in bathhouses, which were favorite social gathering places for men and women of all ages. At special holidays, pretty nude girls could be seen in civic parades. Occasionally, even men of the church appeared completely nude in religious processions.

It was not until after the epidemic spread of syphilis during the 16th and 17th centuries and the rise of the middle classes that nudity began to be viewed as obscene. The whole attitude toward the human physical functions changed. The former intimacy was now rejected as disgusting and unhealthy. People no longer ate from the same dish or drank from the common mug. Instead of their fingers they began to use knives and forks. The wealthy started to wear special sleeping clothes or nightgowns. Privacy became a growing concern. The bed was removed from the living room and hidden in a separate bedroom. The bathhouses were closed, recreational swimming in lakes and rivers became sexually segregated until finally public nude bathing as such was prohibited altogether. In other words, the open acceptance of the body and its functions gradually turned into prudery. By the 19th century, society had become so sensitive about bodily functions that the mere mention of sex, reproduction, digestion, or perspiration was considered offensive. Indeed, even simple words like "thigh" and "breast" could no longer be used in polite conversation. The entire human body was taboo.

As modern Western civilization conquered the world, this prudery was then often imposed by force on uncomprehending and reluctant peoples for whom complete or partial nudity had always been a way of life. Even today, certain struggling Asian and African nations are engaged in an effort to "civilize" their citizens by asking them to wear clothes to which they have never been accustomed. Ironically, in the meantime, some of the richest and most advanced Western nations have begun to revert to the less prudish standards of former historical periods. (For a more detailed discussion of these developments, see the third part of this book, "Sex and Society.")

While our modern culture has subjected us to a great deal of sexual repression, it has nevertheless made an important contribution toward a more humane life for all of mankind—the scientific exploration of the human body and its functions.

Our ancient and medieval ancestors possessed very little exact biological and medical knowledge. When they were sick, they depended largely on folk remedies, superstitions, or outright magic. Magical and mystical beliefs also governed their sexual and reproductive lives. For example, most men and women were convinced that the right "love potion" could win the heart of even the most unwilling partner. There was also a belief that certain experiences of a pregnant woman could "mark" her baby, and that coitus during the night would lead to the conception of blind children. People knew nothing about the circulation of blood, hormones, the male and female sex cells (sperm and egg), and other modern discoveries. In the opinion of the

most respected scholars, not only men but also women produced some seminal fluid, and it was generally assumed that the mixing of these fluids inside the womb was essential for procreation. It was further assumed that the fetus came to life only during the fifth month of pregnancy at the time of the so-called quickening (i.e., the moment when the mother first feels the fetal movements).

These and similar misconceptions were finally laid to rest by modern science. However, the facts as we see them today did not emerge quickly and easily. Some biological laws and the causes of certain diseases were discovered only after centuries of patient observation. Occasionally, scientific research led to such unexpected results that, for a long time, people simply refused to accept them. Indeed, to this very day science continues to challenge our traditional way of thinking and sometimes even our way of life.

A recent striking example is the scientific observation of human sexual responses in the laboratory. The findings disproved many widely held assumptions. It was shown, for instance, that the sexual capacity of women is at least as great as that of men and, in some respects, even greater. Obviously, such a realization cannot remain without consequences for the overall relationship between the sexes. In this, as in other cases, scientific insight may well lead to profound social changes.

Such changes, although perhaps necessary, are not always welcomė. It is therefore hardly surprising that, throughout its history, science has met with a great deal of resistance. Whenever scientists questioned the conventional wisdom they were attacked and ridiculed, and sometimes their discoveries were suppressed and ignored. Very often, however, society objected not only to specific discoveries, but to the very idea of science itself. Even today, many people feel a kind of instinctive revulsion at the humorless, merciless, shameless way in which scientists seem to "take all the mystery out of life."

Indeed, it cannot be denied that there is something sacrilegious about the scientific approach to problems. In their pursuit of knowledge, scientists not only disregard God, but also show little respect for hallowed human traditions. Questions of morality, legality, or even of good taste do not concern them. Nothing is too sacred for their curiosity, and they view everything with the same neutral detachment.

This characteristic detachment of science requires a particular emotional and intellectual discipline, a special frame of mind which is typically "modern." In Greek and Roman antiquity and in the Middle Ages, man considered himself an integral part of the world and would not have wanted or dared to detach himself from it. He was not used to suppressing his feelings or moral concerns, but reacted to everything with his whole personality. He believed not only that he lived at the center of the universe, with the sun, the moon, and all the stars revolving around him, but also that everything in this universe had some personal meaning for him and was somehow related to his fate. Something happened because the gods or God made it happen in order to reward or punish him. For example, health was seen as the reward of righteousness; death and disease were the wages of sin. There

was no differentiation between causal and normative laws. The law of nature was divine will. Explanation and justification were one and the same.

The beginning of modern science can be described as that moment in history when explanation and justification were first separated. As long as health and sickness, sunshine and rain, good and bad harvests were regarded as reward or punishment for man's conduct, factual cause and moral end were always seen together. Science became possible only when man began to disregard all supernatural influences and their meaning. From then on, he studied "nature as such," without any reference to divine intentions and human concerns.

The scientist looks at the human body "objectively," i.e., he regards it strictly as an object to be observed, weighed, and measured. He is not interested in its beauty, sinfulness, or even in its health. His only aim is to understand its functions, not to pronounce them good or bad. He does not make value judgments, but judgments of fact. In other words, the scientist tries to describe what is, not prescribe what should be. If he should find the body to be diseased, he may list the symptoms of the disease and search for its causes, but as a scientist he would make no attempt at healing. That is basically a moral enterprise, and it is undertaken by people who use scientific knowledge to help their fellow human beings. It is true that today the role of the scientist and that of the healer are often played by one and the same person, a physician, for example. Nevertheless, a good physician knows that he does, in fact, perform two separate functions and that, on occasion, he may have to keep them separate. For instance, he may know as a scientist that continued heavy smoking will kill a certain patient. As a healer, he may suggest to the patient that he give up his cigarettes. This suggestion would, of course, be based on the moral (not scientific) judgment that the value of life is higher than that of smoking pleasure. However, if the patient held the opposite values and preferred to die rather than stop smoking, the physician would find himself restricted to his role as a scientist who simply observes the effects of smoking on a dying man. (A dramatic example is the case of Sigmund Freud. As a scientist, he knew that his smoking would kill him. As a healer, he could have acted upon this knowledge and given up his cigars. As a patient, he refused to do so and died of cancer of the jaw.)

Nonscientists often find it difficult to appreciate the scientific point of view. Particularly in the early days of modern science, the majority of people mistook the scientist's suspension of moral judgment for callousness and indifference, if not frivolity. For example, when in the 16th and 17th centuries scientists first dissected human corpses for the sake of anatomical knowledge, their contemporaries were horrified. It would never have occurred to them to "donate their bodies to science." On the contrary, they often prohibited this kind of research altogether. As a result, many anatomists had to keep their work secret and pay criminal "body snatchers" to steal corpses from the cemetery or even right from the gallows. (In our own time, some sex researchers have also had to begin their work in secrecy and to pay prostitutes to serve as objects of study.)

Nevertheless, over the centuries people realized that the objective investigation of the human body and its functions could bring them great benefits. Although the essence of science itself is moral neutrality, scientific knowledge can very well be used for moral purposes. The healing and prevention of diseases is only the most obvious example. Equally important is man's liberation from needless fears and narrow superstitions which prevent him from realizing his full potential. Thanks to science, man has made great progress toward that goal. Indeed, every new scientific discovery adds to his ability to master his own fate.

In recent decades, the advance of sex research has been especially dramatic. Almost every day scientists add to our understanding of the human sexual and reproductive functions. In the past, these functions were firmly linked, and people had little control over them. Sexual intercourse led to reproduction, and reproduction was impossible without sexual intercourse. Unless they were abstinent, sexual partners were unable to limit the number of their children, and many women died of exhaustion after too many births. On the other hand, those couples who remained childless had to accept their infertility as the will of "nature." In the meantime, reproduction has become a matter of conscious choice. Scientific insight into the reproductive process has made it possible to develop effective methods of contraception, and today unwanted pregnancies can easily be avoided. Furthermore, many formerly hopeless cases of infertility can now be treated successfully, sometimes by means of artificial insemination, i.e., without any direct sexual contact. Now for the first time in human history, the sexual and reproductive functions can be completely separated.

These modern developments have far-reaching social consequences as they lend support to the growing demand for full sexual equality. Traditionally, the biological differences between the sexes have always been used as a justification for forcing men and women into different social roles. Thus, men chose to believe that "nature" had destined women for motherhood, and that this "natural" calling made them unfit for any other task. (For some unexplained reason, fatherhood was not considered to have the same crippling effect.) However, now that women have become free to embrace or reject motherhood as they please, such notions are difficult to maintain. Indeed, the belief in the "natural" inferiority of women is now being exposed as nothing more than the ideology of men who want to justify their position of privilege.

We can be certain that continued scientific research will eventually also disprove many of our present beliefs, no matter how self-evident they might seem. Especially when it comes to sex we are not always as detached and objective as we think we are. Very often our observations are colored by unrecognized prejudices and unquestioned moral assumptions, and thus we are still in danger of confusing value judgments with judgments of fact. In short, where our own interests are involved we are as likely as ever to mistake convention for "nature." However, we can learn from the history of modern science that, in the long run, our self-interest is best served by strict

objectivity. Science began when man started to disregard the divine and human aspects of everything he studied. Paradoxically, this very disregard then opened the door to deeper understanding. Only if we are prepared to transcend our narrow personal concerns, can we hope to find out the truth about ourselves and thus become really free.

Thanks to the mass media, new scientific insights into the human bodily functions can now be shared by a greater number of people than ever before. Most men and women today know more about anatomy and physiology than any ancient or medieval doctor. Yet in spite of all their theoretical knowledge, many of them are ill at ease with themselves. Unlike their ancestors, they feel alienated from their own bodies, i.e., they experience them as unfamiliar and strange. Indeed, it seems that the very same historical developments that enabled modern man to look at himself with scientific detachment also robbed him of his former self-acceptance.

Our technological society imposes a great deal of discipline on all of us. We are usually not allowed to express our emotions, follow our impulses, or devote our energies to the pursuit of pleasure. On the contrary, in the interest of our work we have to adjust to fixed timetables for activity and relaxation, always appear even-tempered, suppress any sign of spontaneity, and deliberately dull our senses. In short, we are forced to transform ourselves into well-functioning instruments of labor. As a result, we have become used to treating the human body as a machine, and our increased understanding of its functions is mainly used to add to its "efficiency."

Many people also carry this attitude over into their sexual relationships. This becomes apparent, for example, in their great concern with youth and physical vigor. Thus, they are often quite eager to try any new diet, experiment with any new drug, use any new gadget or device, and train themselves in any new technique that promises to strengthen their erotic capacities. Furthermore, there are now countless sex guides, love books, and marriage manuals which discuss the technical aspects of sex in great detail and thereby hope to turn the reader into an expert lover.

There is no doubt that such books can indeed be very helpful. After centuries of repression, a frank description of human sexual functioning and the possible variations of sexual intercourse can free men and women from unnecessary inhibitions. Unfortunately, some of them also gain the false impression that sexual happiness is a matter of great expertise and athletic ability, and since they themselves seem to lack either talent or practice, they end up feeling inadequate. In fact, even many of those who succeed in mastering all erotic skills discover that the mere mechanics of sex leave them unsatisfied. Eventually, they realize that the desire to control and manipulate their bodies for the sake of performance cripples them as human beings. It depersonalizes all their relationships, and finally renders them incapable of true enjoyment.

It is for this reason that, in recent years, more and more people (especially the young) have abandoned the mechanistic approach to sex and have developed a less demanding attitude toward the human body. They are beginning

to understand that the modern world of discipline and competition has distorted their perceptions, and they try to regain the sensual awareness of former historical periods through "sensitivity training." Thus, they literally get back in touch with themselves and arrive at a point where they can accept and appreciate their own bodies without exploiting them.

At the same time, most young men and women today have again become able to look at the nude human body without embarrassment. Indeed, for many of them nudity is now once more a familiar sight to which they do not attach any exaggerated significance. However, it is unfortunate that there also continues to be widespread and persistent ignorance about the bodily functions, especially those that have to do with sex. Indeed, there remain not only some prudish members of the older generation, but also a few of the new one who are uninformed or even seriously misinformed about the physiological processes underlying their behavior. It therefore seems both justified and necessary to take advantage of the welcome new climate of sexual candor and to offer an unobstructed, if somewhat limited, view of the subject.

The following pages provide some basic information about the sexual aspect of the human body, especially the male and female sex organs, the human sexual response, reproduction, contraception, and abortion. In addition, there is a brief discussion of some physical disorders that can impair normal sexual functioning. The psychological aspects of human sexual behavior are discussed in the second part of this book, "Human Sexual Behavior."

1. THE PROCESS OF SEXUAL DIFFERENTIATION

The sex of a human being is determined at the time of fertilization. However, for the first few weeks of their lives the unborn males and females are indistinguishable. Their maleness or femaleness manifests itself only gradually over a period of time.

We are all used to identifying newborn children as either boys or girls according to their different external sex organs. Still, apart from these organs, they look very much alike. The typical male or female appearance of men or women results from developments that do not begin until many years later. The full extent of human sexual differences appears only after both males and females have reached sexual maturity, i.e., when they can have children of their own.

Most of us think of sex as the simplest and most fundamental of all human distinctions. Indeed, this very assumption is implied in our language. The word "sex" is derived from the Latin *sexus* which, in turn, has its roots in the verb *secare:* to cut, separate, or divide. In the strict sense of the term, therefore, "sex" simply refers to that which divides the human race (and most higher animal and some plant life) into two distinct groups—males and females. Every individual belongs to either one of these groups, i.e., to one of the two sexes. A person is either of male or female sex.

All of this seems plain enough. However, recent scientific research has shown that the traditional simple definitions of maleness and femaleness are quite inadequate and that, in some cases, the matter can actually be very complicated. When a modern scientist is asked to identify a person as either male or female, he takes at least seven different factors into account:

1. Chromosomal Sex

The cells of the male body contain one X and one Y chromosome, while those of the female body contain two X chromosomes. However, recently several other chromosomal combinations have been discovered.

2. Gonadal Sex
The male has testicles (male gonads); the female has ovaries (female gonads). However, in rare cases both testicular and ovarian tissue may be present in the same body.

3. Hormonal Sex
The hormones secreted by the testicles or ovaries play an important part in developing the male or female body before birth and during puberty. A lack, imbalance, or oversupply of these hormones has a decisive influence on a person's anatomy and physiology.

4. Internal Accessory Reproductive Structures
The male has sperm ducts, seminal vesicles, a prostate gland, etc., while the female has Fallopian tubes, a uterus, a vagina, etc. In rare cases, some or all of these organs may be underdeveloped or missing.

5. External Sex Organs
The male has a penis and a scrotum; the female has a clitoris, major and minor lips, etc. In rare cases, some or all of these organs may be underdeveloped or missing.

6. Sex of Assignment and Rearing
A child with a male body will usually be raised as a male. However, it is possible to raise such a child as a female, and vice versa.

7. Sexual Self-identification
A child with a male body who is taught to assume the role of a male will usually learn to consider himself male. However, it is possible that in spite of parental suggestions he nevertheless ends up identifying himself as female. Conversely, a child with a female body who is taught to assume the role of a female may nevertheless identify herself as male.

Scientists now realize that these seven variables may be independent of each other. For example, a newborn child may have the internal sex organs of a female while the external sex organs appear to be those of a "sexually unfinished" male. On the basis of this deceptive appearance, the child may then be declared a boy and raised as such. (See also "Sexual Malformations.") Another example is a person whose sexual self-identification is at odds with the sex that has been assigned to him. (See "Transsexualism.") Such possible incongruities can, of course, create many medical and social problems. Fortunately, most people are clearly male or female by all seven criteria and therefore require no special professional help during their sexual development.

However, even where maleness and femaleness are not in doubt, there still may be some uncertainty about the proper social roles of males and females. Thus, in the past men and women were often assumed to have very little in common. They were not only expected to look different, but also to behave

differently. Based on this expectation, most societies developed different social roles and different moral standards for the two sexes.

Modern research has raised a great deal of doubt about these traditional assumptions, although one major difference between males and females remains undisputable: that which concerns their reproductive functions. While both sexes are needed to make the creation of new human life possible, only women actually conceive, bear, and nurse children. In most other respects, however, the sexual differences are not as fundamental as it might seem. Indeed, many male and female characteristics that were formerly considered inborn and unchangeable have been shown to be inbred, i.e., the result of cultural influences. It is, of course, not always easy to draw a dividing line between biological inheritance and social conditioning. The scientific study of these matters is still in its beginnings. In the meantime, it seems useful to remember the many similarities between the sexes. Generally speaking, men and women would far better understand each other if they realized that they are alike in their basic anatomy and physiology.

The following pages summarize the physical differences between the sexes as they emerge during the process of sexual maturation. For sexual differences in behavior and social status, see "The Development of Sexual Behavior" and "The Social Roles of Men and Women."

MALE AND FEMALE ANATOMICAL DEVELOPMENT

The anatomical difference between men and women is not very great. Even their sexual systems are quite similar and, indeed, in their first stages of development they are indistinguishable. Later structural modifications make the male and female sex organs complementary to each other, but even then one can still recognize their common origin. In other words, while the sexual differences (just as all other physical features of the future human being) are already programmed into every fertilized egg, they materialize only slowly over a period of time. In some isolated instances, the development may even be thwarted and remain incomplete. (See "Sexual Malformations.")

As mentioned earlier, in some cases it may be difficult to identify a particular individual as male or female. However, in our everyday lives we are usually content with determining a person's sex on the basis of certain obvious characteristic physical and psychological traits. Traditionally, these traits have been known as sexual characteristics, and they can be divided into three different categories:

1. **The primary sexual characteristics** are the external sex organs. They are already present at birth and thus make it possible to determine whether a newborn child is a boy or a girl.

2. **The secondary sexual characteristics** are those physical features that develop during puberty and which further accentuate the anatomical difference between males and females.
3. **The tertiary sexual characteristics** are those psychological qualities that are nurtured in one sex and discouraged in the other.

The primary and secondary sexual characteristics are biologically determined, and they constitute a person's maleness or femaleness. The tertiary sexual characteristics are culturally determined, and they constitute a person's masculinity or femininity.

The following paragraphs restrict themselves to the physical characteristics. For the psychological aspects of sexual differentiation, see "The Development of Sexual Behavior" and "The Social Roles of Men and Women."

THE PRIMARY SEXUAL CHARACTERISTICS

The sex organs are the most obvious sexual characteristic. They are also the only external sign of whether a newborn baby is a boy or a girl. However, while the male and female sex organs are very different in appearance, they are similar in origin and structure. In fact, they develop from the same embryonic cell mass. The difference comes about only gradually during the baby's growth before birth. (Also see "Pregnancy.") The sex organs do not become fully functional until after puberty when, under the influence of certain hormones, they finally complete their growth. (Also see "The Role of Hormones.")

The Male

In the first weeks after conception, the male as well as the female embryo is a tiny organism without recognizable human features. However, it does have a primitive head and limb buds which begin to grow into real arms and legs. The embryo further possesses a ridge of tissue which is destined to develop into sex organs. Indeed, the first beginnings of sex glands or gonads can already be found, but, at this point they are still sexually undifferentiated, i.e., they are the same for both sexes. Externally, a hump (suggestive of the male) with a groove (suggestive of the female) can be observed at the spot where the future sex organs will grow. As the male embryo slowly begins to look more human toward the end of the third month of its life, the hitherto undifferentiated gonads develop into testicles. The external hump assumes the shape of a penis, and the groove closes. (As evidence of this original groove, each male retains a pink scar line running down the underside of his penis all the way from the glans to the anus.) Two patches of skin on either side of the hump begin to form the scrotum. (In the female, they become the major lips to the vulva.)

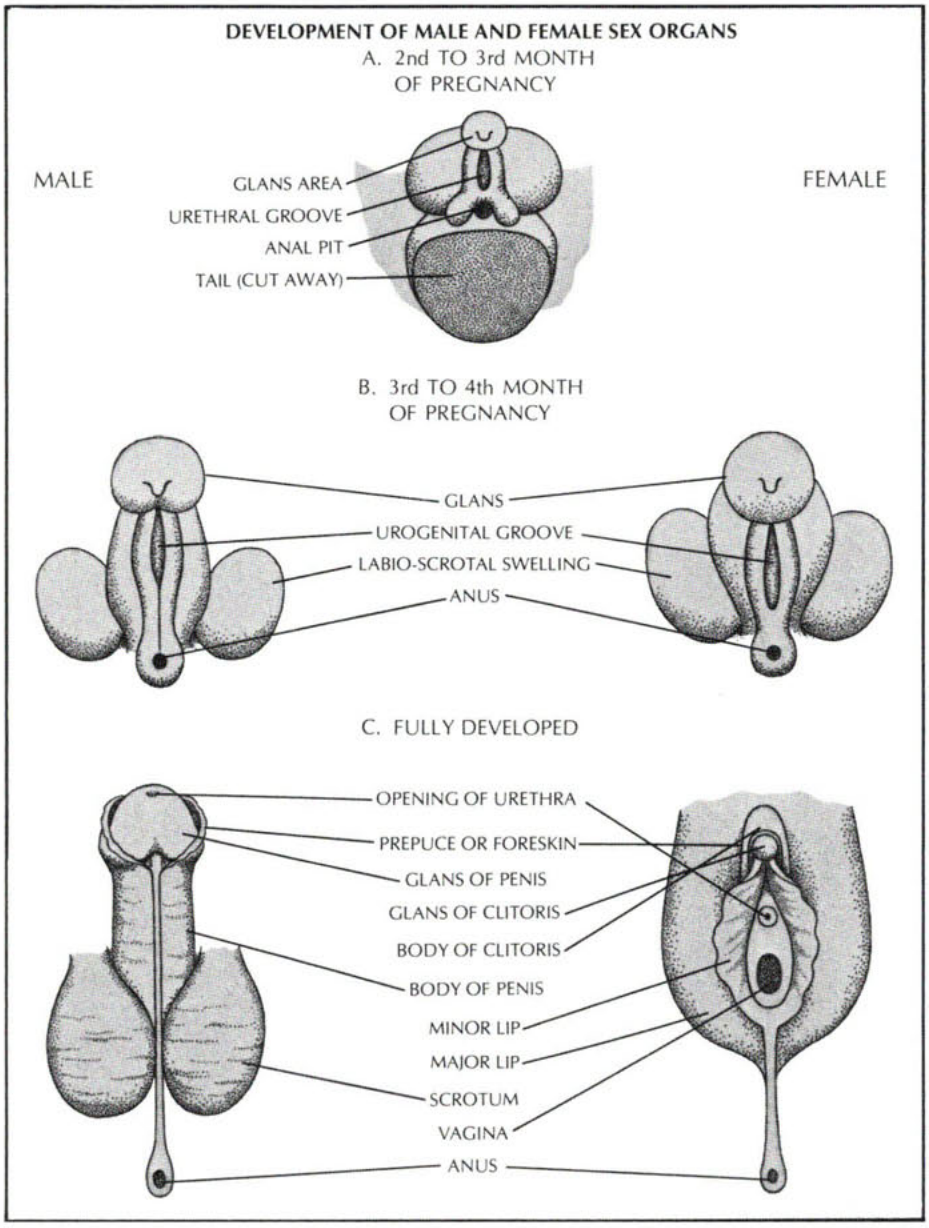
As the embryo grows into the fetus, the sex organs continue to develop together with the entire body. Between the seventh and ninth months the testicles normally descend into the scrotum.

In the period between birth and puberty, the sex organs do not show any dramatic further development. However, during the ages of 12 to 17 boys

normally experience a noticeable growth of their sex organs and eventually their first ejaculation of semen. They will also notice that some hair (called pubic hair) begins to grow at the base of the penis. All of this indicates that the sex organs are completing their maturation. (For further details, see "The Male Sex Organs.")

The Female

Both the female and the male embryo remain sexually undifferentiated for the first few weeks of their lives. They do possess the beginnings of sex glands or gonads, but these beginnings are the same for both sexes. Just as the male, the female also shows a hump and a groove at the spot where the future external sex organs will develop. However, in her case the hump



develops into the clitoris while the groove remains open, forming the minor lips and the vestibule of the vulva. Two patches of skin on either side develop into the major lips. (In the male, they develop into the scrotum.) The original gonadal structures which develop into testicles in the male evolve into ovaries in the female.

Between her birth and puberty, a girl's sex organs do not undergo any dramatic further development. However, during the ages of 11 to 13 some hair (pubic hair) will begin to grow on her vulva, and her first menstruation can normally be expected at that time. These signs indicate that she is close to sexual maturation. (For further details, see "The Female Sex Organs.")

THE SECONDARY SEXUAL CHARACTERISTICS

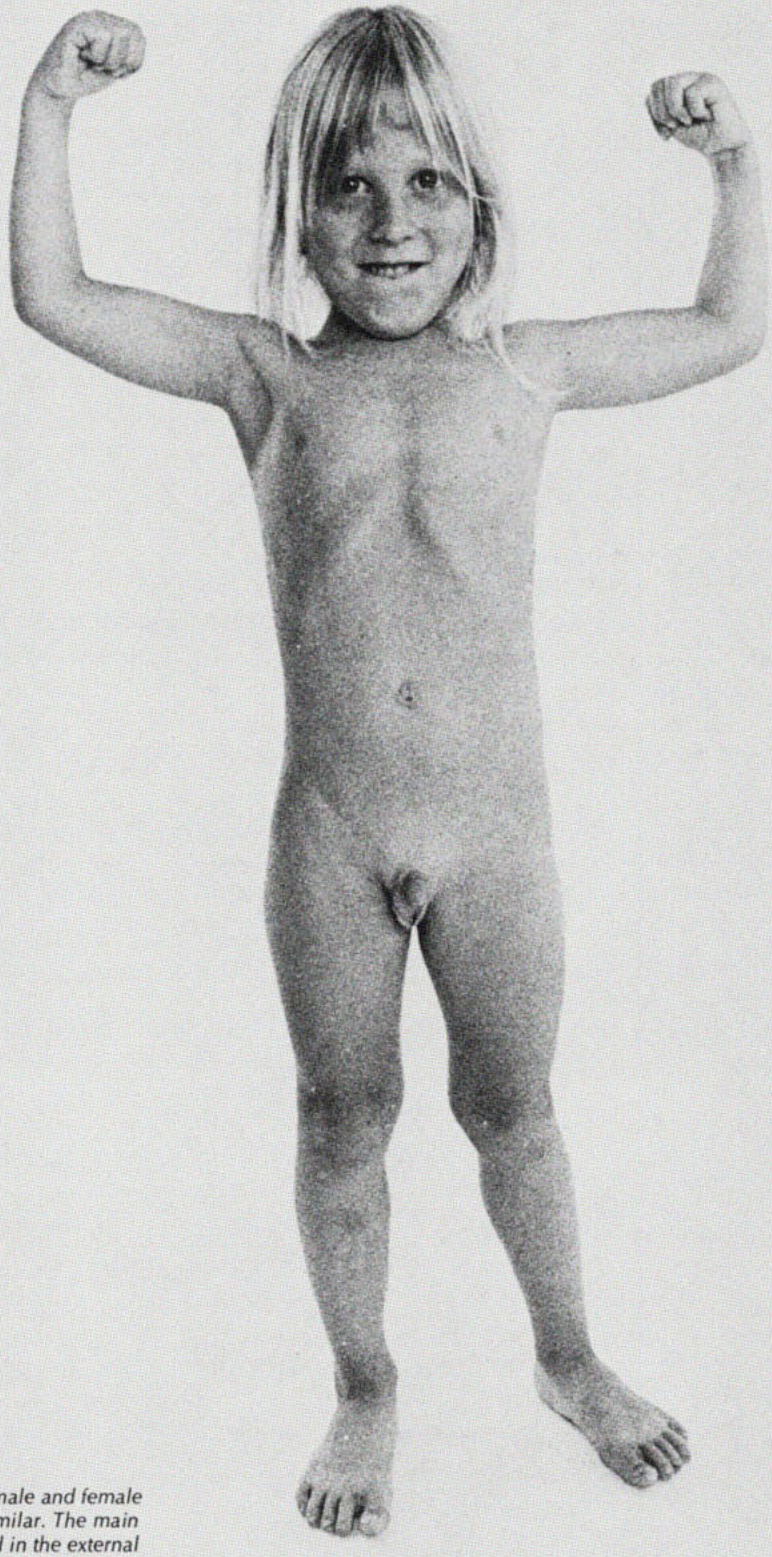
The secondary sexual characteristics begin to appear during puberty as a result of hormonal stimulation. They become apparent first in females, a little later in males. By the time their physical growth is completed, the bodies of men and women show several marked differences. (See also "The Role of Hormones.")

The following paragraphs summarize the physical changes of puberty. These changes may occur very slowly and extend over a period of more than a decade, or they may appear rather suddenly and be completed within one or two years. While general social conditions, diet, and climate may affect the development, much of it is also determined by heredity. For example, Asian men usually remain less muscular and develop less facial and body hair than European men.

The Male

In the male, the first body changes of puberty are the growth of the testicles, the appearance of pubic hair at the base of the penis, and an enlargement of the penis. These changes indicate that the body is reaching sexual maturity, and sometime thereafter the first ejaculation can occur. However, at first the ejaculate may not contain any sperm cells, but consist mainly of fluid from the prostate gland. (The first ejaculation may occur during masturbation or spontaneously while the boy is asleep. In the latter case, he is said to have a "wet dream.")

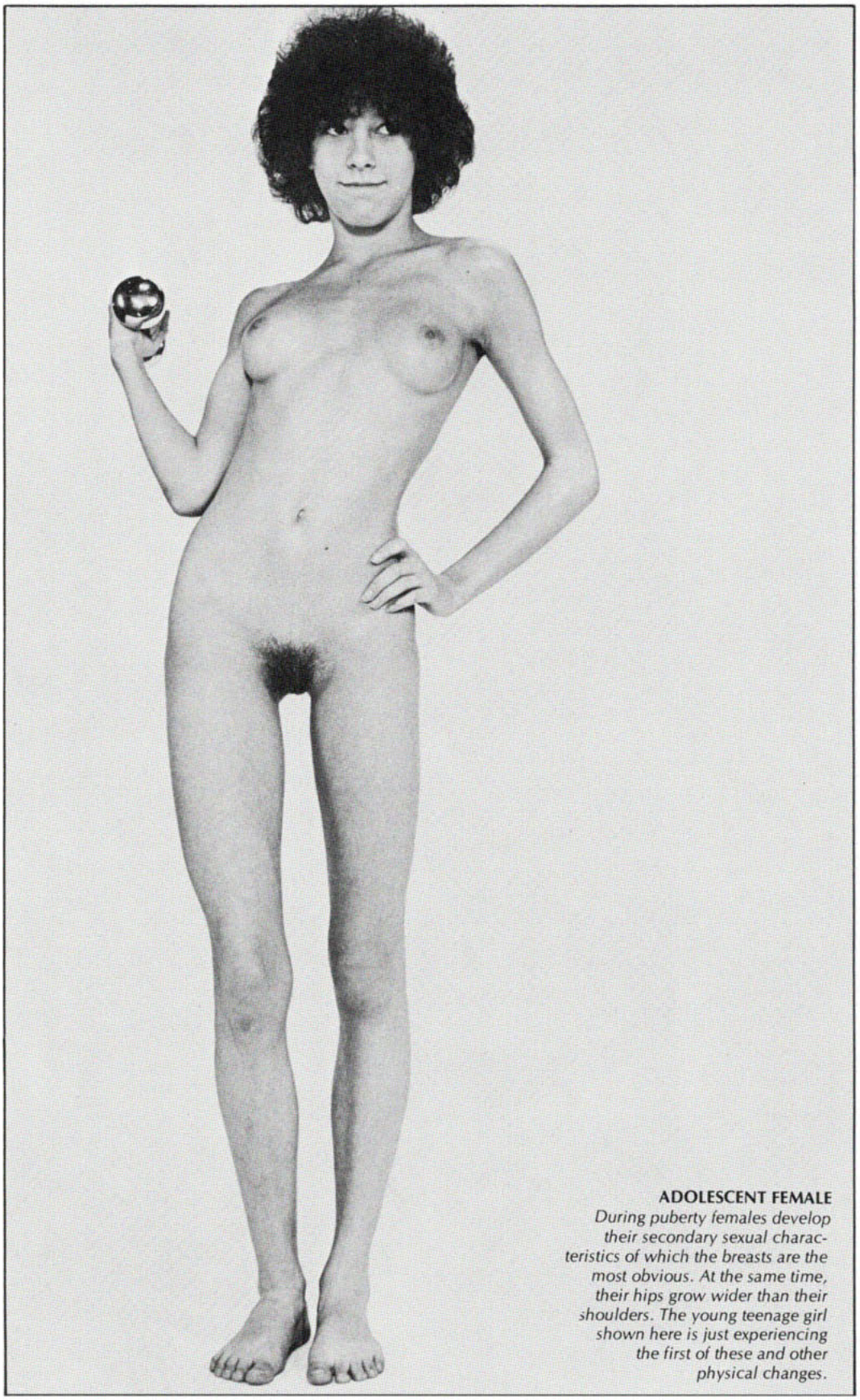
During puberty, the body grows rapidly in size. The shoulders become wider than the hips, the chest enlarges in every dimension, and the muscles in the arms, legs, and shoulders grow stronger and more obvious. The pubic hair becomes more dense and rather kinky, gradually forming a triangle that points upward toward the navel. Some hair also develops in the armpits (called axillary hair) and, in some males, on the chest. Generally, the male is hairier than the female. Eventually, he also develops facial hair which will grow into a beard unless it is shaved off regularly. As the male sex organs grow in size, the larynx (voice box or "Adam's apple") also enlarges. As a result, men generally have a deeper voice than women.



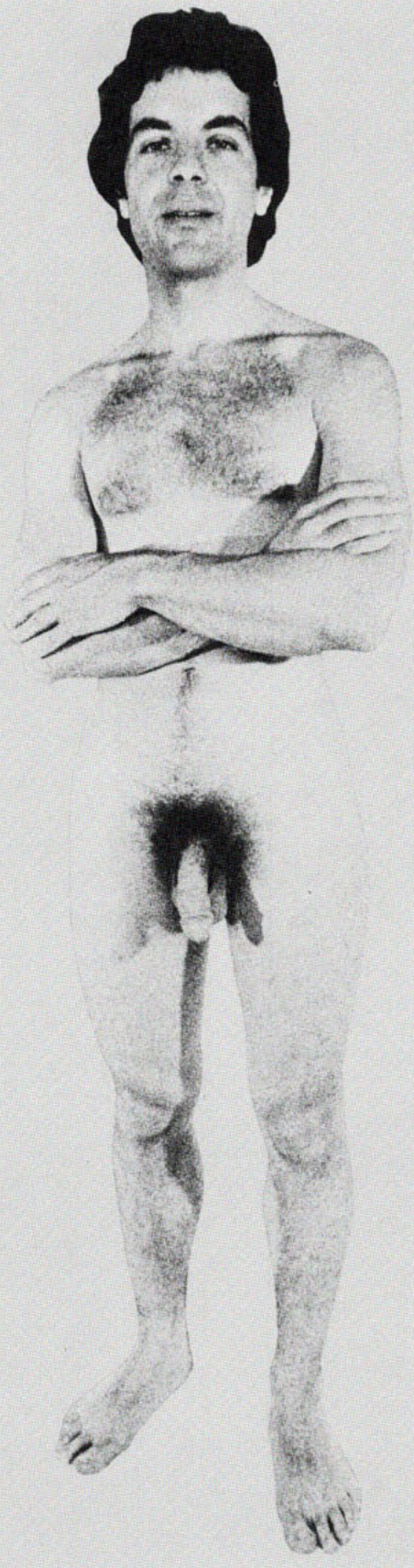
BOY (AGE 5)
In childhood the male and female bodies are very similar. The main difference is found in the external sex organs i.e. in the primary sexual characteristics.

GIRL (AGE 7)

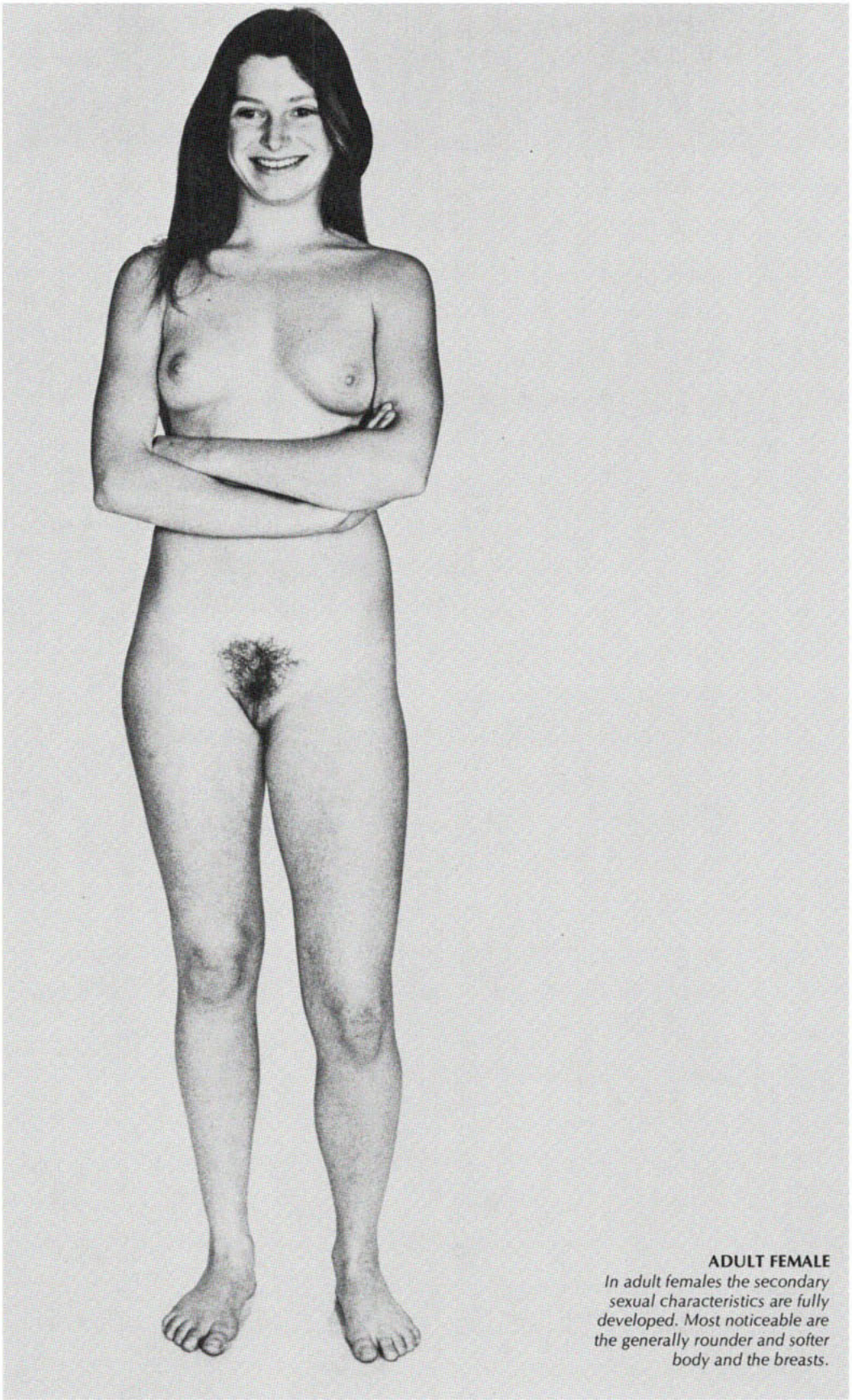
ADOLESCENT MALE
During puberty both males and females rapidly gain in height and develop their secondary sexual characteristics. In males, the body becomes more muscular, and the shoulders grow wider than the hips.



ADOLESCENT FEMALE
During puberty females develop their secondary sexual characteristics of which the breasts are the most obvious. At the same time, their hips grow wider than their shoulders. The young teenage girl shown here is just experiencing the first of these and other physical changes.

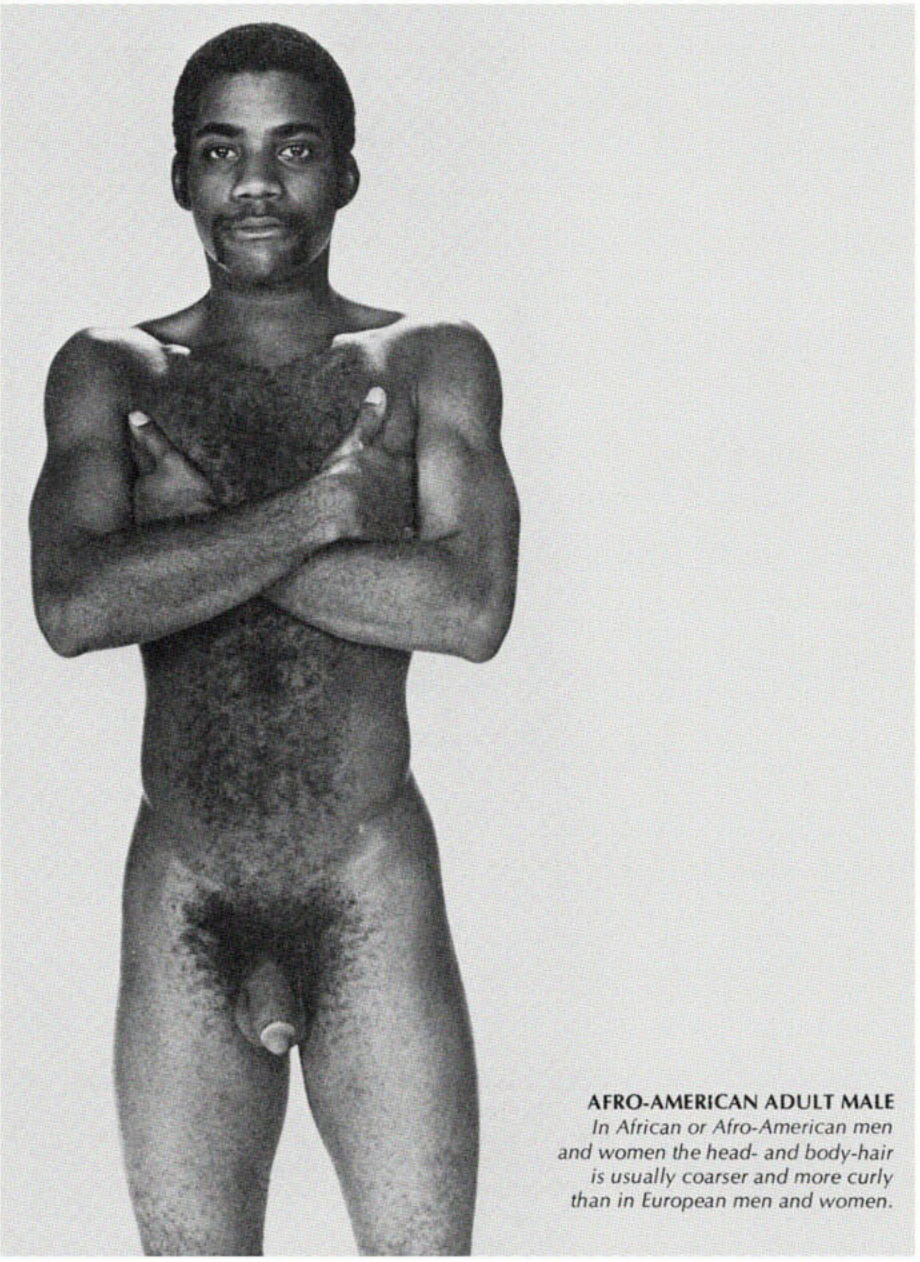


ADULT MALE
In adult males the secondary sexual characteristics are fully developed. Most noticeable are the generally more angular and muscular body and, in some males, the growth of hair on the chest.



ADULT FEMALE
In adult females the secondary sexual characteristics are fully developed. Most noticeable are the generally rounder and softer body and the breasts.

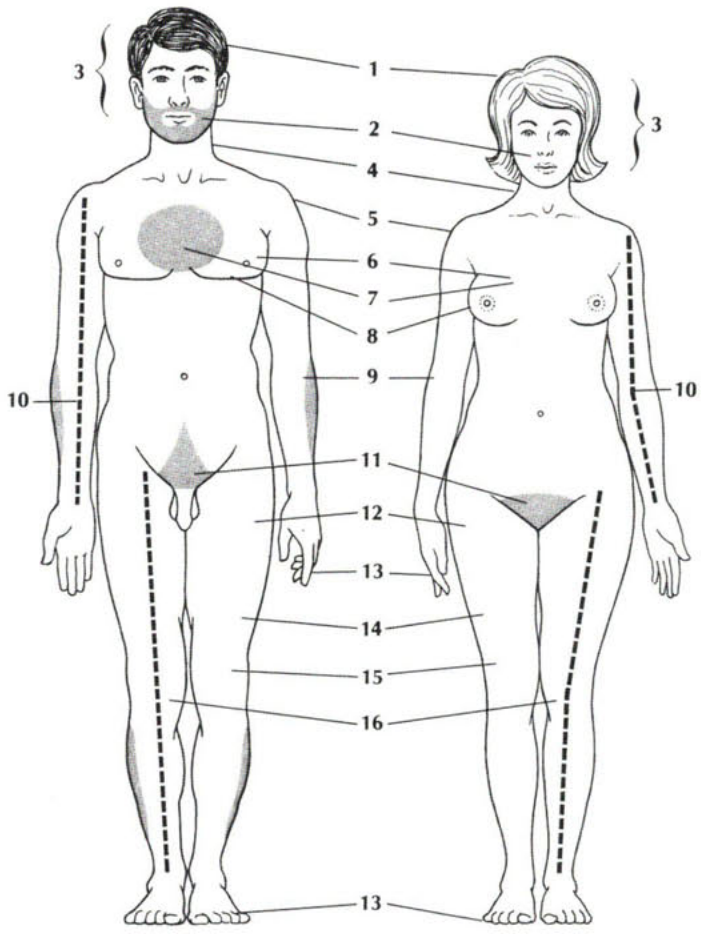
ASIAN ADULT MALE
Many Asian men are less muscular and have less facial and body hair than most European men.



AFRO-AMERICAN ADULT MALE
In African or Afro-American men and women the head- and body-hair is usually coarser and more curly than in European men and women.

The Female

Females experience the physical changes of puberty in the following order: First, the breasts begin to enlarge. Then some straight and later kinky or curly hair appears on the vulva. This pubic hair forms a triangle pointing downward. Eventually, some hair will also appear in the armpits (called axillary hair). During this time, the body grows in height, and the hips become wider than the shoulders. Fatty tissue in and around the breasts, shoulders, hips,



THE SECONDARY SEXUAL CHARACTERISTICS

The Male: On the average, taller and heavier than the female.
1. *Head hair:* may fall out with age. **2.** *Facial hair:* grows throughout adult life. **3.** *Features:* more pronounced, face longer, head (front to back) longer. **4.** *Neck:* thicker, longer, larynx one-third larger. **5.** *Shoulders:* broader, squarer. **6.** *Chest:* larger in every dimension. **7.** *Body hair:* more evident, especially on chest and arms. **8.** *Breasts:* rudimentary in size. **9.** *Muscles:* bigger, more obvious. **10.** *Arms:* longer, thicker, "carrying angle" straight. **11.** *Pubic hair:* growing up to a point, forming triangle. **12.** *Hips:* narrower. **13.** *Hands and feet:* larger, fingers and toes stronger and blunter. **14.** *Thighs:* more cylindrical with bulge of muscles. **15.** *Legs:* longer, bulging calves. **16.** *Angle of thigh and leg:* as with "carrying angle" of arm, forming straight line, thigh to ankle.

The Female: On the average, shorter and lighter than the male.
1. *Head hair:* more lasting. **2.** *Facial hair:* very faint, usually noticeable only in later years. **3.** *Features:* more delicate, face rounder, head smaller, rounder (from top). **4.** *Neck:* shorter, more rounded, larynx smaller. **5.** *Shoulders:* more rounded, sloping. **6.** *Chest:* smaller, narrower. **7.** *Body Hair:* very light and faint. **8.** *Breasts:* prominent, also well-developed nipples with large surrounding rings. **9.** *Muscles:* largely hidden under layers of fat. **10.** *Arms:* "carrying angle" bent. **11.** *Pubic hair:* forming straight line across at top. **12.** *Hips:* wider, more rounded. **13.** *Hands and feet:* smaller and narrower. **14.** *Thighs:* wider at top and shorter in length. **15.** *Legs:* shorter with smoother contours. **16.** *Angle of thigh and leg:* as with "carrying angle" of arm, slightly bent, forming an angle at the knee.

and buttocks gives the female body its generally rounder appearance. The first menstruation (also known as menarche) indicates approaching sexual maturity. In the beginning, the menstrual cycles are still irregular, and in some of them there may be no ovulation. In other words, for a while a girl may menstruate and still be largely infertile. Indeed, a woman usually gains her full reproductive capacity only one or two years after her first menstruation.

In females, there is no decisive enlargement of the larynx and therefore no voice change comparable to the one taking place in males. In general, women are also less muscular and slightly shorter than men.

At the end of puberty, the breasts have developed their typical rounded shape and thus become the most obvious female secondary sexual characteristic. However, they do not produce milk until after pregnancy. (See "Birth.")

THE ROLE OF HORMONES

The proper anatomical development of males and females as well as their ability to reproduce depend on the functioning of special glands in their bodies. The scientific study of these glands and their secretions is still in progress and much remains to be learned about them.

People have, of course, long been familiar with some of the more complex glands (such as those in the mouth, skin, or female breast) which release their particular secretions (saliva, sweat, milk) onto a surface through their own ducts. Such secretions are easily detected, traced, and measured, and they serve an obvious localized function. However, the human body also possesses ductless glands which release their secretions directly into the bloodstream. These glands are called endocrine (Greek: internally secreting) glands. Their secretions, which may stimulate or regulate the functioning of various other, often remote organs, are known as hormones (from the Greek *hormaein*: to arouse). Every human body contains a number of endocrine glands and many different hormones which serve a great variety of purposes. The following paragraphs restrict themselves to a discussion of those hormones that affect a person's sexual and reproductive capacities.

In regard to sex and reproduction, the most important endocrine glands are the pituitary gland and the male and female gonads or sex glands. The pituitary gland is located at the base of the brain. It is sometimes called the "master gland" because its hormones stimulate and coordinate the other endocrine glands. Among the pituitary hormones that are of particular interest here are FSH (follicle-stimulating hormone) and LH (luteinizing hormone). They stimulate the male and female gonads to produce hormones of their own. (In males, LH is usually referred to as ICSH [interstitial-cell-stimulating hormone] because it acts upon the interstitial cells, the producers of hormone in the testicles.

The gonads or sex glands are the testicles in the male and the ovaries in the female. (See "The Male Sex Organs" and "The Female Sex Organs.") The hormones produced by the gonads are called gonadal hormones, and they can be divided into clearly distinct groups. One group of hormones that are particularly prominent in mature males are known as androgens. Another group of hormones particularly prominent in mature females are known as estrogens. (The female gonads also produce still another hormone called progesterone, which is important for a woman's reproductive life.) However, while there is a preponderance of androgens in men and of estrogens in women, both groups of hormones are present in every individual. The gonadal hormones play an important role in a person's sexual maturation. Their first decisive influence appears even before birth.

The human embryo is sexually undifferentiated during the first few weeks of its life. The primitive beginnings of its gonads are the same for both sexes. At the spot where the future external sex organs are destined to grow, there is a hump (suggestive of the male) and a groove (suggestive of the female). A clear differentiation begins only toward the end of the second month after conception. In the case of a male embryo, the production of the hormone testosterone (one of the androgens) is started, which slowly transforms the embryonic genital hump into a penis. The groove running down its underside closes, forming a single internal tube: the urethra. The gonads become identifiable as testicles, and, in the last weeks before birth, they descend into the scrotum. Without this prenatal production of testosterone in males, their proper anatomical development is impossible.

In the case of a female embryo, nothing special or additional is needed because the external and internal sex organs differentiate "automatically." (In a sense, therefore, the female sex might be called the "basic" or "primary" one.) In the absence of a specific stimulation by androgens, the originally undifferentiated gonads are transformed into ovaries. The embryonic genital hump grows into the clitoris. (Compared to the penis, the clitoris remains much smaller because of a lack of testosterone to stimulate its growth.) The genital groove, on the other hand, remains open and deepens, forming the minor lips and the vestibule of the vulva.

In the period between birth and puberty, there are no further dramatic changes in a person's sexual development. The levels of androgen and estrogen remain rather low and are nearly equal in both sexes. At about the age of eight, a gradual buildup of hormone levels begins. By about ten or eleven, this increase becomes very substantial, especially in females. The pituitary gland releases great quantities of FSH and LH (called ICSH in males) which stimulate the secretion of gonadal hormones as well as the production of sperm in the testicles and of eggs in the ovaries. In males, the androgens rise to a slightly higher level than the estrogens, and, in females, the estrogens rise to a much higher level than the androgens. As a result of this intensified hormonal bombardment, the male and female bodies develop their secondary sexual characteristics. This general physical maturation also fully develops the capacities of the nervous system, and thus creates the basis for the complete male and female sexual response.

In those rare cases where boys or girls lose or fail to develop their gonads, their overall physical development is affected. Their ability to respond sexually remains limited and, of course, the secondary sexual characteristics never become pronounced. For example, a boy whose testicles fail to descend or who is castrated before puberty retains a rather juvenile general appearance and never experiences the typically male enlargement of the larynx and the resulting voice change. In 18th-century Europe music lovers took advantage of this fact when they provided the opera stage with a very special type of human voice—that of the *castrato.* A great number of young boys with promising voices were castrated in order to preserve their tonal clarity and high pitch. At the same time they received a rigorous musical training. Eventually some of them developed into adult male sopranos or contraltos of incomparable vocal force and virtuosity who could look forward to a life of fame and fortune. The greatest composers, such as Handel, Gluck, and Mozart, wrote major parts in their operas for castrated males. Since today this type of voice is no longer available, these operas have to be rearranged for modern voices, or they are simply no longer performed.

The castration of adults does not have the same obvious result as that of children. This has long been known in many Asian and Middle Eastern countries where, in the past, adult male slaves or servants were castrated for the sake of obtaining harem guards who would be unable to impregnate their master's wives. (Actually, a sterilization would have been sufficient for this purpose.) Apart from their infertility these so-called eunuchs did not necessarily show any other physical deficiencies. The modern stereotype of the eunuch as a falsetto-voiced, bald, fat weakling is false. Again, the public of 18th-century Europe seems to have had a remarkable and very realistic appreciation of the biological facts. For example, in Mozart's popular opera, *The Abduction from the Seraglio,* the part of the harem guard is, quite appropriately, written for a deep bass voice (moreover, he is portrayed as quite lecherous). As a rule the adult human body is capable of adjusting to a lack of gonadal hormones within a few months, although in some instances there may be some premature physical deterioration over the years. In any case today the effects of castration, such as they are, can be almost completely corrected by hormonal treatment.

As mentioned earlier, the scientific study of hormones continues as many important questions about their effects are still unanswered. Nevertheless there is now some general, if vague, knowledge of these problems among the public at large. Indeed, many men and women today discuss hormonal influences as readily and casually as their diets. Unfortunately many popular notions about the role of hormones are quite mistaken, especially in regard to sex.

Part of the confusion can be explained by the history of endocrinology (the study of endocrine glands and their secretions). Among the first hormones to be discovered were those secreted by the gonads or sex glands. Since the gonads were known to produce male and female gametes or sex cells, the gonadal hormones were soon simply referred to as sex hormones, and they

were also divided into male and female sex hormones. However, this all too convenient analogy is faulty. While the male sex cells (sperm) are produced only in the male (and are therefore properly named), the so-called male sex hormones (androgens) are produced in both males and females. Correspondingly, the female sex cell (egg) is produced only in females (and is therefore properly named), whereas the so-called female sex hormones (estrogens) are produced in both sexes. The distinction between "male" and "female" sex hormones is therefore misleading. In fact, it is regrettable that the gonadal hormones were ever called "sex hormones" in the first place, because this term has led to the misconception that they somehow determine sexual behavior. For example, some people believe that the sex hormones are the direct cause of sexual desire, and that an increase in these hormones will increase the desire just as effectively as their reduction will reduce it. Indeed, there is a widely held false opinion that one can prevent a man from engaging in any sexual activity at all by depriving him of his sex glands and thus his "sex hormones." In some countries sex offenders are being castrated under the assumption that this will put an end to their offensive behavior. However, modern scientific studies clearly show that, for a grown man, the removal or loss of the testicles may have little or no immediate effect on his sexual capacities. (Except, of course, that he becomes infertile. The same is true for a woman whose ovaries become inactive after menopause. Her sexual responsiveness remains undiminished.) Still, the indignity of a forced castration may cause severe psychological damage to someone who shares the common sexual superstitions. In this indirect way his sexual abilities may very well become impaired. The lack of androgens alone does not necessarily diminish sexual interest or inhibit sexual expression. It often decreases the level of sexual performance somewhat, but drastic changes may not become obvious until many years later.

Among the general public it is still not always understood that, in human beings, the ability to reproduce and the ability to respond sexually are two different matters. While the sex glands are indispensable for a young person's physical maturation and human reproduction, they are not essential for the sexual responsiveness of adults. In other words, there can be no reproduction without sex cells (sperm and egg), but there can very well be sexual activity without "sex hormones" (androgens and estrogens).

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2. THE SEX ORGANS

Males and females are said to have reached sexual maturity when they are able to have children of their own. Since the two sexes play different roles in the creation of new life, the male and female bodies show several obvious differences. An understanding of these differences (as well as the similarities) can help men and women to make each other happy as lovers and to recognize their specific responsibilities as potential parents. It seems useful therefore to consider the sexual anatomy and physiology of males and females in two separate chapters. The following pages provide a discussion of those aspects of the male body that are relevant to sexual activity and procreation.

THE MALE SEX ORGANS

From the dawn of mankind the human sex organs have been regarded as special and essentially different from all other parts of the body. Some ancient peoples worshiped them and believed them to be endowed with magical powers. By contrast, our own culture has for a very long time treated them mainly as an embarrassment. Indeed, there have been periods when the sex organs were considered so shocking, shameful, vile, and dirty that they were all but unmentionable. Eventually it became improper to even think about them. In short, there seemed to be a general conspiracy to deny their very existence.

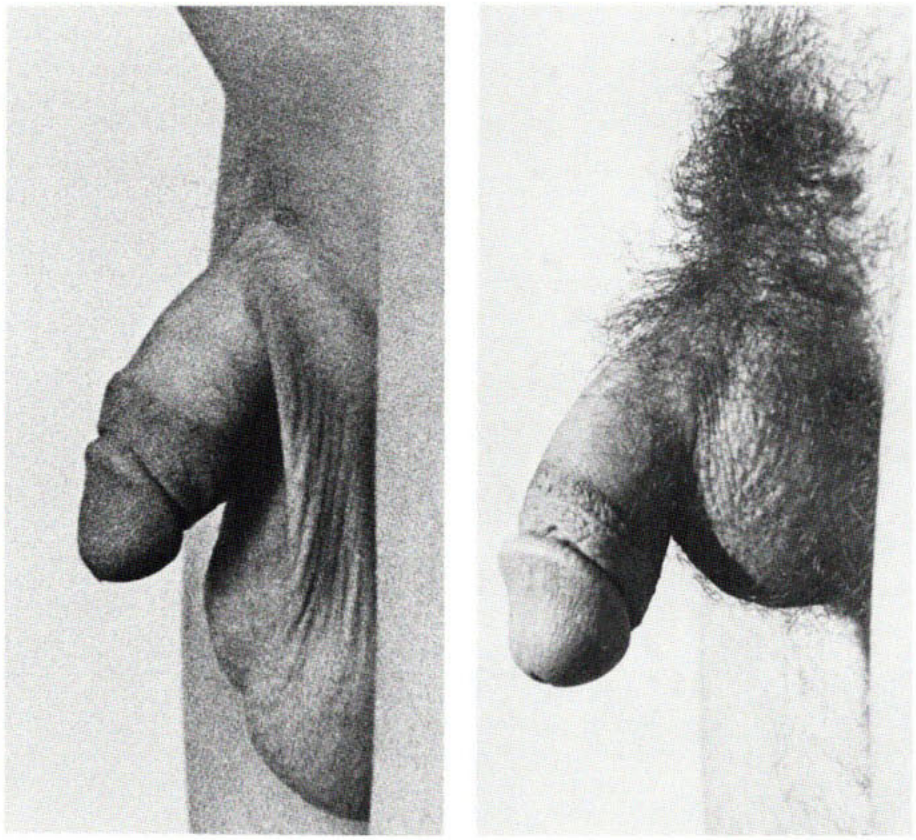
While most people today no longer respond in this extreme fashion, there are still many who feel uncomfortable discussing the subject openly, and it must also be admitted that our standard language is curiously inadequate when it comes to anything sexual. Most available words reflect moral opinions rather than scientific observations. Purely descriptive and accurate terms are rare. For example, in most medical and professional textbooks the sex organs are called genitals (Latin *genitalia*: organs of generation) or "reproduc-

tive organs." These terms emphasize the possible child-producing, procreative function of the sex organs at the expense of their pleasure-giving, erotic function. Such one-sided terminology can lead to one-sided interpretations. It may allow certain people to forget that in human beings procreation and sex can be completely separated. Most of the time the so-called reproductive organs are not used for the purpose of reproduction at all, but function exclusively as organs of sexual pleasure. This is already obvious to children who may experience orgasms many years before they can reproduce. As a matter of fact, for the human race in general the reproductive function of the sex organs is a relatively late discovery. There have been primitive peoples who were quite unaware of it, although they obviously enjoyed sexual intercourse.

The expression "sex organs" used in this book is not very precise either since it has a double meaning. First of all, the term refers to those organs that determine a person's sex. In this sense the sex organs are those that account for the greatest physical difference between the sexes. For this reason the sex organs are also called primary sexual characteristics. Secondly, the term "sex organs" suggests that these organs are involved in a person's sexual response. Indeed, some people are under the false impression that the "sex organs" are the only organs so involved. However, the human sexual response is not restricted to a few particular organs but is a response of the whole body. Thus the mouth and the skin, for example, are also "sex" organs because they transmit and receive sexual stimulation. Nevertheless, as long as this fact is kept well in mind the use of the term "sex organs" in the present narrow sense seems defensible.

For some men and women the usual medical terms sound too technical and explicit. They prefer instead to speak euphemistically of "private parts." This term suggests that the sex organs should remain undiscussed, hidden, and secret, and that they are somehow more personal than, for example, the mouth, the eyes, or the ears. However, such an attitude is an expression of moral values that are far from universal. There have been cultures where the so-called private parts were very public indeed, and where giant replicas of male and female sex organs were proudly displayed in temples, theaters, and other gathering places. Furthermore, many societies not only encouraged public nudity, but, in some cases, made the sex organs especially conspicuous by elaborate ornamentation.

Many young people today also find little need for prudery. As a rule they are neither awed nor disgusted by any part of the human anatomy. Instead they are simply curious. For them sex is just another part of life with which they have to become familiar. Particularly during puberty, when they observe their own sexual maturation, they often feel alienated from their bodies. They demand objective information as a means to get back in touch with themselves. As such information becomes generally available in the future, the sex organs are likely to lose much of their former mystery and fascination. On the other hand, a realistic understanding of their own sexual anatomy may very well help many people to lead healthier and more productive lives.



The male external sex organs (1) before and (2) after puberty

The following pages present a detailed description of the male sex organs beginning with those that are visible outside the body. In a young person these external sex organs usually create the greatest initial interest. However, in order to understand their function, one also has to consider the internal sex organs of which many people never become aware at all.

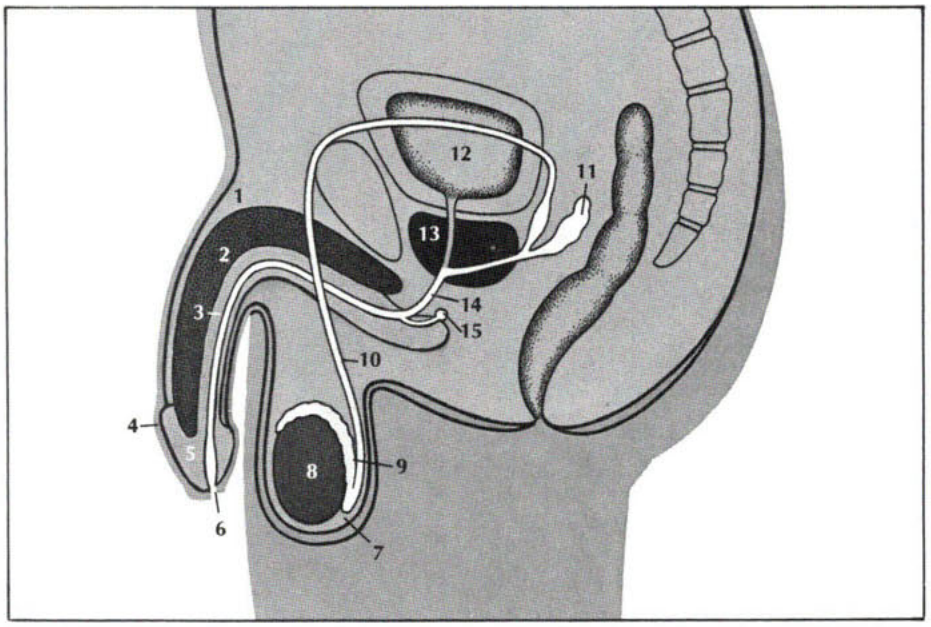
THE EXTERNAL SEX ORGANS

The male external sex organs consist of the penis and the scrotum. The testicles and their attachments, which are contained in the scrotum, are usually considered internal organs, although they are outside the abdominal cavity.

The Penis

The penis (Latin: tail) is a cylindrical organ which contains erectile tissue. To be more precise, there are three elongated spongy bodies inside the penis which extend through its entire length—two running parallel on top (the two *corpora cavernosa*) and one running along the underside (the *corpus spongio-*

sum). This latter body contains the urethra (the duct through which urine and semen are released). Heavy arteries can quickly fill these spongy bodies with blood, thus causing them to stiffen. As a result, the penis becomes erect. Conversely, when the blood leaves the spongy tissue the erection subsides. Erections of the penis are usually triggered by sexual excitement, but they can also occur for other reasons. (For details, see "The Male Sexual Response.")



THE MALE SEX ORGANS

1. Penis 2. Corpus cavernosum (one of a pair) 3. Corpus spongiosum 4. Foreskin 5. Glans 6. Opening or urethra 7. Scrotum 8. Testicle (one of a pair) 9. Epididymis (one of a pair) 10. Vas deferens (one of a pair) 11. Seminal vesicle (one of a pair) 12. Urinary bladder 13. Prostate gland 14. Urethra 15. Bulbourethral (Cowper's) gland (one of a pair)

During an erection the penis increases in size. This is possible because the skin covering it is very loose. In fact, toward the end of the penis some of this skin forms a freely hanging fold known as the foreskin or prepuce. This foreskin normally covers the tip or head of the penis called the glans. In the case of an erection, however, the glans protrudes from the foreskin and becomes fully exposed. The glans is usually slightly thicker than the body of the penis, and its shape has been compared to that of an acorn. (Glans is Latin for acorn.) Actually it is the extension of the *corpus spongiosum*, and it contains the external opening of the urethra. Since its smooth surface is studded with innumerable nerve endings, the glans is extremely sensitive to the touch, particularly around its rim. By the same token it is also an important source of sexual pleasure for the male.

The underside of the glans is attached to the foreskin by a thin tissue called frenum. Behind the rim of the glans and under the foreskin there are glands that secrete a cheese-like substance known as smegma. If the foreskin is tight this smegma may accumulate and cause irritation. In any case, good personal hygiene demands daily washing of the glans and removal of the smegma. For this the foreskin has to be pulled back.

Tightness of foreskin (also called phimosis) is one of the reasons for a popular operation called circumcision. It consists of the surgical removal of the foreskin. This practice has a long tradition among Jews and Moslems, for whom it also has a religious significance. However, in the meantime circumcision has found wide general acceptance, and in the United States today most males are circumcised as a matter of course right after birth regardless of their religion. Circumcision has no effect on a man's sexual abilities.

The average length of a grown man's penis is between 3 and 4 inches when flaccid and between 5 and 7 inches when erect. However, there may be great variations in size from one individual to the next. Contrary to some widely accepted myths, the size of the penis is not related to a man's body build, skin color, or sexual prowess. A very short man may have a larger penis than a tall one (and vice versa), a white man may have a larger penis than a black man (and vice versa), and a man with a small penis may have more orgasms than a man with a large penis (and vice versa). Furthermore, some penises which greatly differ in size when they are flaccid may be of identical size when they are erect.

For reasons that are not entirely clear, many men in our culture seem concerned about the size of their penises. However, such concern is completely unwarranted. Even a penis that remains relatively small during an erection serves every function of a larger penis. A woman's vagina, for instance, adjusts to any penis, no matter what its size, and since the vaginal walls contain few nerve endings, any difference in the woman's sensations depends on the firmness of her muscles surrounding the vaginal barrel as well as psychological factors. (For details, see "The Female Sexual Response.") The latter is also true for sensations inside the rectum during anal intercourse. There is practically no feeling at all beyond the anal sphincter muscles. (This, incidentally, is the reason why some people who introduce long and hard objects into their rectum may seriously hurt themselves without realizing it.)

The Scrotum

The scrotum is a bag or pouch of skin which contains the testicles, and which hangs between the thighs at the base of the penis. The skin of the scrotum is comparatively dark and contains many sweat glands. Inside the scrotum there are two separate compartments, each of which contains one testicle and its spermatic cord which leads upward into the abdominal cavity. Part of this spermatic cord is a thin tube through which the sperm travels—the *vas deferens*. It is this *vas deferens* that is cut in a vasectomy. (For details, see "Contraception.") The spermatic cord also contains blood vessels, nerves, and muscles. In response to certain stimuli, especially cold tempera-

tures, these muscles contract and pull the testicle closer to the abdomen. At the same time, the skin of the scrotum will also contract and appear thick and wrinkled. Ordinarily, however, the scrotum hangs loose, and its skin looks thin and smooth. In a way the scrotum acts like a thermostat, trying to provide an even temperature for the continuous production of sperm which is taking place inside the testicles. This temperature has to be slightly lower than that of the rest of the body.

THE INTERNAL SEX ORGANS

The male internal sex organs consist of the testicles which produce hormones and sperm, a system of ducts which transport and store the sperm, and some accessory organs whose secretions become part of the ejaculated semen.

The Testicles

The testicles (the male sex glands or gonads) are formed within the abdomen during the development of the embryo. However, before the birth of a baby boy they normally descend into his scrotum. In the mature male the testicles are two oval-shaped bodies of about 1½ inches in length which are suspended in two separate sacs inside the scrotum outside the abdominal cavity. Although both testicles are of about the same size, the left one usually hangs a little lower and thus may give the appearance of being larger.

The testicles serve a double function:

- They produce sperm which may be ejaculated through a system of genital ducts.
- They produce hormones which are secreted directly into the bloodstream.

The Production of Sperm

A testicle is composed of hundreds of small compartments which contain tightly coiled tubes not much thicker than a hair. Inside these tubes (called seminiferous tubules) the process of sperm production (called spermatogenesis) takes place. This process begins when the male reaches puberty and continues without interruption throughout his life. The production of sperm proceeds in three steps:

1. The first step begins with the cells that lie closest to the outer edge of the tube. These cells are called primitive spermatogonia and, like any other cell in the body, they have 46 chromosomes, including an X chromosome and a Y chromosome. By means of cell division a single primitive spermatogonium forms two new identical daughter cells. One of these takes the place of the original cell, while the other moves toward the center of the tube. This latter cell is called the primary spermatocyte.

2. The primary spermatocyte does not duplicate itself the way all other cells do, but divides in a unique way: It splits in half, as it were, allotting 22 chromosomes plus 1 X chromosome to one of the new cells, and 22 chromosomes plus 1 Y chromosome to the other. The two new cells are called secondary spermatocytes, and each of them contains only half as many chromosomes (23) as all other body cells.

3. The two secondary spermatocytes move even closer to the center of the tube, and each divides again in the ordinary fashion, duplicating itself exactly. The four new cells are called spermatids. These spermatids now change their shape, develop a tail, and thus grow into mature sperm cells called spermatozoa. The entire process through all three stages of development takes about 64 days. As is obvious from their origin and development, spermatozoa come in two varieties: those containing an X chromosome (and 22 other chromosomes), and those containing a Y chromosome (and 22 other chromosomes). In case of a fertilization the X-bearing spermatozoa will help to produce girls; the Y-bearing spermatozoa will help to produce boys. (For details, see "Conception.")

The Production of Hormones

As described in a previous section, the male and female gonads (testicles and ovaries) also produce certain hormones. These gonadal hormones have been divided into male hormones (androgens) and female hormones (estrogens). However, these terms are somewhat misleading because both "male" and "female" hormones can be found in every male and female body. It is only the quantity of these hormones that differs. Before puberty, the androgen and estrogen levels in boys and girls are nearly equal. Then, during adolescence, the balance begins to shift. In the male body the androgens rise to a slightly higher level than the estrogens, and in the female body the estrogens rise to a much higher level than the androgens.

In the male the increase of androgens during puberty helps to produce the secondary male sexual characteristics. In the female the increase of estrogens helps to produce the secondary female sexual characteristics. There is still much to be learned about the role of hormones in the human body. Nevertheless, a few basic facts have already been established:

While the gonadal hormones are necessary for a young person's physical maturation, they are not essential for the continued sexual activity of adults. In other words, males and females need the gonadal hormones during adolescence to develop their full sexual potential. However, once the potential has been attained they can function sexually without these hormones. This has long been recognized in the case of women whose gonads (the ovaries) cease functioning after menopause without diminishing their sexual responsiveness. Many people are less willing to concede that the same is also true for men who might be deprived of their gonadal hormones (by castration, for example). Indeed, in many countries adult males are still being castrated in the belief that this will eliminate their sexual capacities. However, this belief is erroneous. (For details, see "The Role of Hormones.")

THE SYSTEM OF GENITAL DUCTS

The sperm cells produced in the testicles are transported to their point of discharge from the body by a system of genital ducts. These ducts, which consist of matched pairs (in sequence: epididymides, vasa deferentia, ejacula-

tory ducts), lead from the testicles into the abdominal cavity where they eventually join the urethra, a single tube which discharges sperm as well as urine.

The Epididymides

The sperm cells which are constantly being produced in the seminiferous tubules are moved into collection tubes which lie on the surface of each testicle. Such a collection tube is called epididymis (plural: epididymides), and it is about 20 feet long. However, it is so twisted and convoluted that it seems no longer than the testicle itself. A sperm cell needs several weeks to traverse the collection tube. During this time it develops a limited ability to move by itself.

The Vasa Deferentia

Once the sperm cells have emerged from the collection tube, they enter a shorter and rather straight tube called vas deferens (plural: vasa deferentia). This tube leads from the scrotum into the abdomen. The lower portion of the vas deferens can be felt through the scrotal skin. Since it is so easily located, it can also easily be cut in a sterilization operation known as a vasectomy. (For details, see "Contraception.")

Inside the abdomen the two vasa deferentia (one associated with each testicle) bend in a long curve and lead up to a point behind the urinary bladder where they become enlarged, each forming a sort of sac or storage compartment called ampulla (plural: ampullae). The sperm cells are moved to these storage compartments to await ejaculation. The ampullae join the ducts of two other sac-like organs, the seminal vesicles, to form short and straight tubes called ejaculatory ducts. These ejaculatory ducts run inside the prostate gland and there join the urethra. (For details, see below.) Before entering the ejaculatory ducts, the sperm cells have only a limited capacity of moving by themselves. Instead, they are transported mainly by the movement of tiny hair-like structures inside the tubes and by muscular contractions. However, immediately upon ejaculation they begin to move very vigorously. This dramatic change is produced by several fluids from various sources which together make up the semen. Swimming in the semen, the sperm cells gain their full energy.

The Urethra

The urethra is a single tube which leads from the bladder to the tip of the penis. (The urethra should not be confused with the two ureters which lead from the kidneys to the bladder.) In the male, the urethra serves two important functions: to release either urine or semen. (Because of certain muscles, urine and semen cannot be released together.) While the urine enters the urethra directly from the bladder, the semen is composed of several different fluids which enter through special openings in the urethral wall mainly in the region of the prostate gland.

ACCESSORY ORGANS

In order to survive after their ejaculation, the sperm cells need to swim in a thick, nourishing, protective fluid called semen. Actually, the semen is composed of several different fluids which come together at various points in the urethra. The most important of these fluids are produced by the organs described below.

The Seminal Vesicles

The seminal vesicles are two sacs which lie next to the ampullae (the enlarged endings of the vasa deferentia) behind the bladder and near the top of the prostate gland. It was formerly believed that the seminal vesicles just served as storage space for accumulated sperm. However, today the opinion prevails that their main function is to provide a fluid which, together with that of the prostate gland, activates the vigorous movement of the sperm cells after ejaculation.

The Prostate Gland

The prostate gland is a firm, round body about the size of a chestnut, and it lies directly below the bladder. It is traversed by the urethra as well as the two ejaculatory ducts described earlier. The prostate constantly produces secretions. Some of these are passed off with the urine. Others make up the greater portion of the semen.

In some older men, the prostate gland enlarges, causing pressure on the enclosed part of the urethra and thus making urination difficult. In these cases, the removal of the prostate by surgery may become necessary.

The Bulbourethral Glands (Cowper's Glands)

Below the prostate gland, there are two small glands about pea size which during sexual excitement secrete a clear, alkaline fluid into the urethra. Often a small drop of this fluid can be seen at the opening of the penis well in advance of an actual ejaculation. It is not entirely impossible for the drop to contain some stray sperm cells. (This could account for the rare cases of pregnancy without ejaculation of semen.)

The semen discharged in an ejaculation (usually somewhat less than a teaspoonful) is composed of sperm cells and secretions from the epididymides, the seminal vesicles, the prostate gland, and the bulbourethral (Cowper's) glands. None of these fluids contains any harmful substances. People who swallow semen, whether by accident or on purpose, have no reason to fear any ill effects. Semen is usually thick and greyish-white in color. However, at times it may also be thin and rather watery. The exact amount, consistency, and composition of semen depends on the frequency of ejaculations.

THE FEMALE SEX ORGANS

An objective study of the female sex organs has always been difficult, and thus for a very long time their function was less well understood than that of the male sex organs. One reason for this ignorance was the social emphasis and overemphasis on the reproductive role of women. There simply was not enough interest in learning about their orgasmic potential. Another reason is the anatomical fact that the most important female sex organs are either barely visible or completely hidden from view in the abdominal cavity. A woman's external sex organs, which can be examined easily, offer no clue as to the physiological processes taking place deeper inside. Women thus often find it hard to understand their own bodily functions. Fortunately, modern scientific research has made this task much easier. While many questions are still unanswered, it is now nevertheless possible to provide every woman with enough information for the purposes of everyday life. Such factual information can dispel many lingering fears and old superstitions while helping both sexes to develop a mature and responsible attitude toward the female sex organs.

THE EXTERNAL SEX ORGANS

The female external sex organs consist of the mons Veneris, the major and minor lips, the clitoris, and the vaginal opening. All of these parts together are also often referred to collectively as the vulva (Latin: covering).

The Mons Veneris

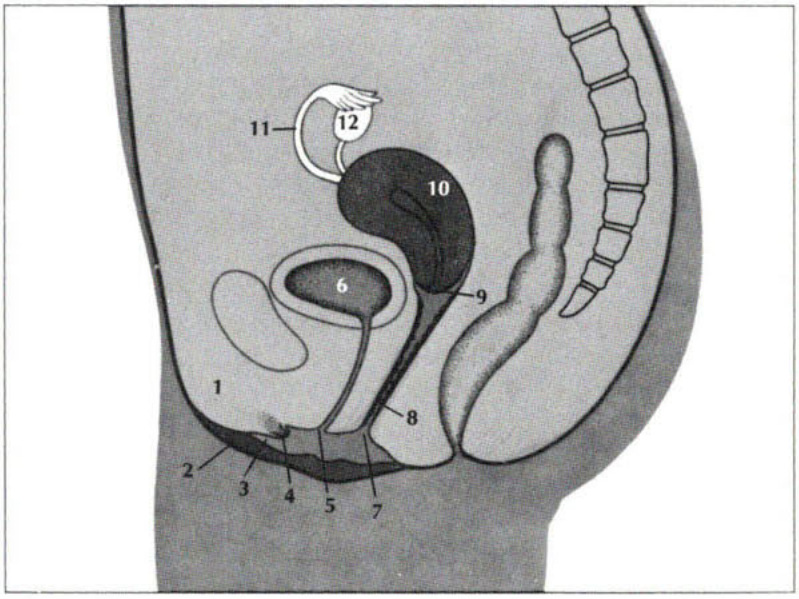
The mons Veneris (Latin: mountain of Venus) consists of fatty tissue under the skin just over the pubic bone. On the outside, the area is covered with pubic hair, which first develops during puberty, and which makes the mons veneris by far the most conspicuous part of the vulva.

The Major Lips

The major lips (*labia majora*) are two thick and fatty folds of skin which extend from the mons Veneris downward, forming the outer borders of the vulva. On the outside, they are also covered with hair just as the mons Veneris. As the major lips usually lie close together, they seem to keep the other parts of the vulva covered.

The Minor Lips

Just beneath the major lips lie the minor lips (*labia minora*). These are two thin folds of skin richly endowed with blood vessels and nerve endings. As a result, they are quite sensitive to the touch. The minor lips merge at the top forming a single fold of skin covering the clitoris. This fold is also called the foreskin or prepuce of the clitoris, or simply the clitoral hood.



THE FEMALE SEX ORGANS

1. Mons Veneris 2. Major lip (one of a pair) 3. Minor lip (one of a pair) 4. Clitoris 5. Opening of urethra 6. Urinary bladder 7. Vaginal opening 8. Vagina 9. Cervix 10. Uterus 11. Fallopian tube (one of a pair) 12. Ovary (one of a pair)

The Clitoris

The clitoris (Greek *kleitoris*: that which is closed in) is located below the mons Veneris at the point where the minor lips meet. The clitoris is a short cylindrical organ composed mainly of erectile tissue, i.e., of two spongy bodies (*corpora cavernosa*) which can quickly fill with blood and thus cause the entire organ to stiffen and increase in size.

The clitoris is partly covered by the clitoral hood or foreskin. It is possible for genital secretions (smegma) to accumulate under this foreskin, thus causing irritation and other problems. (See "Pain During Sexual Intercourse.")

The average length of a clitoris in its unexcited state is less than an inch and most of it is hidden from view. However, in the state of excitement it may swell to twice its usual diameter. In a way, the clitoris can be compared to a very small penis, and its glans, which is normally exposed, is extremely sensitive to the touch as it is studded with innumerable nerve endings. Unlike the penis, however, the excited clitoris does not protrude but retracts under its hood. The clitoris is easily excitable by mechanical stimulation, and it plays an essential role in a woman's sexual excitement. (For details, see "The Female Sexual Response.")

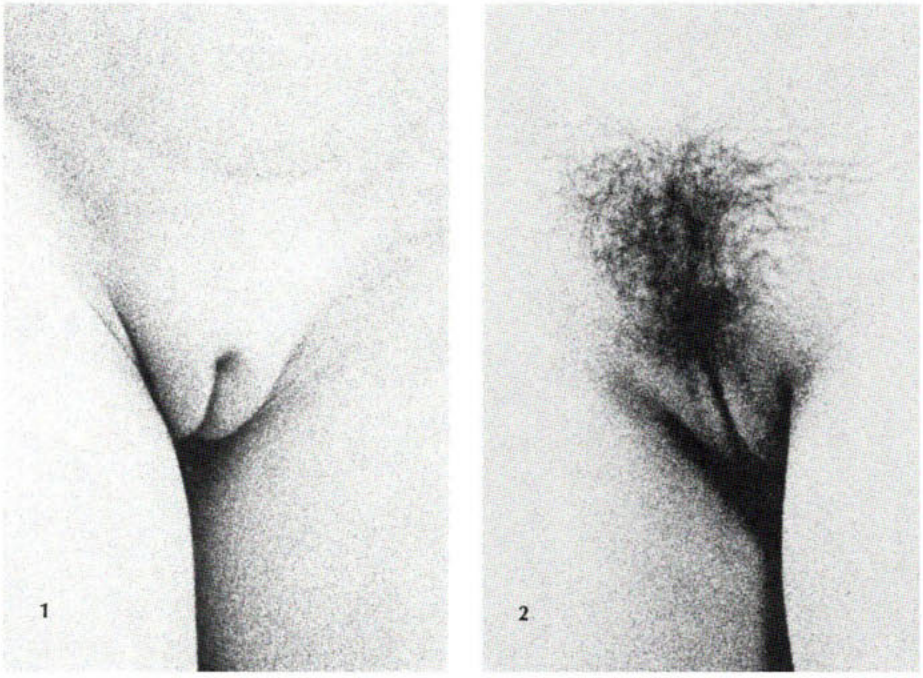
The Vaginal Opening

The vaginal opening lies below that of the urethra which, in females, is independent from the sex organs and is used exclusively for the release of urine. The urethral opening is very small, and it lies roughly halfway between the clitoris and the vaginal opening. By contrast, the vaginal opening is rather

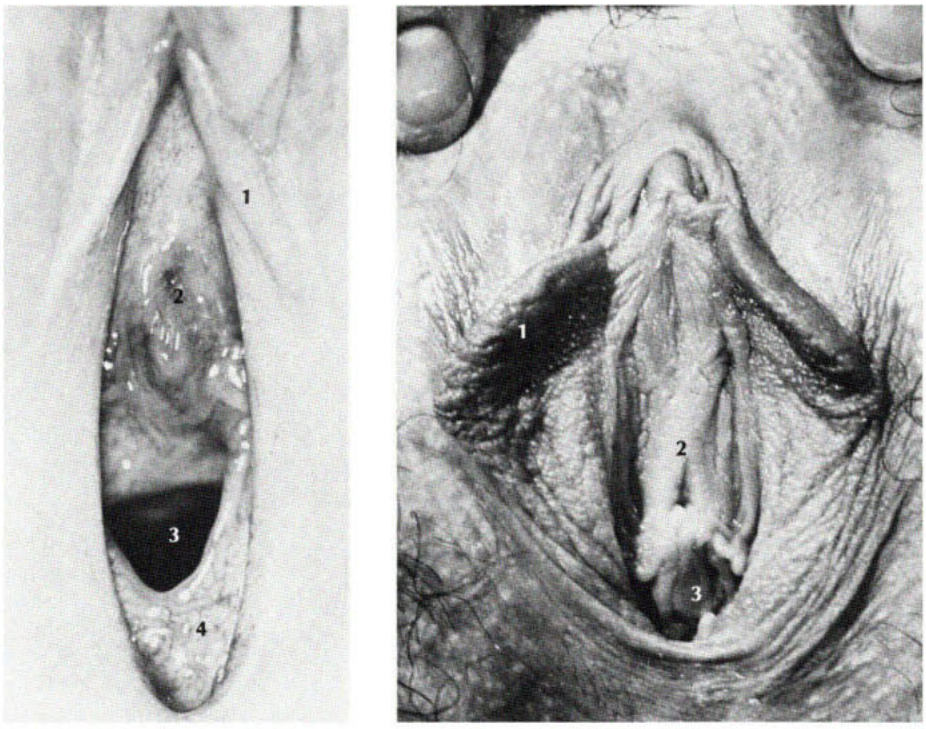
large, although it may be partially closed by a thin membrane called the hymen.

The hymen has no known physiological function. Nevertheless, in the past many people ascribed great significance to it. For example, it was believed that an unbroken hymen provided proof of a woman's virginity. However, such a belief is nothing more than a superstition. A hymen usually has one or several holes in it which may be stretchable and thus allow for the insertion of fingers, or even a penis, without tearing. On the other hand, in some women the hymen tears easily, not only as a result of coitus but also because of strenuous physical exercise or sports activities. In some cases, the hymen is even absent altogether. It follows from these observations that the condition of a woman's hymen does not prove anything one way or the other about her sexual innocence or experience. In most cases, the first coitus may very well be the occasion for the breaking of the hymen, but it can, of course, also occur during masturbation and petting, or when the woman first uses menstrual tampons. The tearing of the hymen may cause some initial discomfort and slight bleeding. However, there is no reason for women to fear any great pain.

On both sides of the vaginal opening, between the edge of the hymen and the minor lips, are the greater vestibular glands (Bartholin's glands), which correspond to the bulbourethral (Cowper's) glands in the male. The greater vestibular glands secrete a small amount of lubricating fluid. However, most of the vaginal lubrication needed for coitus is not provided by these glands but by the wall of the vagina itself.



The female external sex organs (1) before and (2) after puberty.



EXTERNAL SEX ORGANS OF A YOUNG GIRL

The clearly visible hymen stretches partly across the vaginal opening. 1. minor lips 2. opening of urethra 3. vaginal opening 4. hymen

EXTERNAL SEX ORGANS OF A WOMAN

The hymen having been torn, is absent. 1. minor lips 2. opening of urethra 3. vaginal opening

THE INTERNAL SEX ORGANS

The female internal sex organs consist of the ovaries, the Fallopian tubes, the uterus, and the vagina.

The Ovaries

The ovaries (the female sex glands or gonads) are two walnut-sized bodies which are located inside the abdomen on either side of the uterus.

The ovaries serve a double function:

- They produce eggs which are released into the Fallopian tubes.
- They produce hormones which are secreted directly into the bloodstream.

The Production of Eggs

Before a baby girl is born, all of the cells that will later grow into eggs are already formed in her ovaries. In their primitive beginnings, the cells are called oogonia. These oogonia turn into primary oocytes, some of which eventually give rise to mature eggs (ova).

The process of egg production, called oogenesis, begins in the female fetus, but soon comes to a halt at birth. Thus, every girl is born with nearly 500,000 primary oocytes which remain in their state of suspended development until she reaches puberty. (During this time no new oocytes are produced. On the contrary, most of those that had developed earlier gradually die. By the time a girl reaches puberty, there may be no more than 30,000 primary oocytes left that are capable of further development. At the age of thirty, this number has dwindled even further to about 10,000, and when the woman reaches her menopause, all primary oocytes are gone.) Once the process of oogenesis has resumed during puberty, one or several mature eggs are produced each month by either one of her ovaries until both of them cease functioning following menopause. In the course of her fertile life, a woman may produce some 400 mature eggs. Of course, only a very small fraction of these can ever contribute to conceptions.

All of this provides a striking contrast to the way sperm cells are produced in the male (continuous production of millions of sperm daily, beginning with puberty; for details, see "The Male Sex Organs").

The development of a mature egg proceeds in several steps: Each primary oocyte is contained in a cluster of supporting cells. These clusters lie beneath the outer layer of the ovary. Each month, under the influence of certain hormones, one of the clusters grows to a point where it appears as a rather large blister on the surface of the ovary. This blister is called a Graafian follicle (after the 17th-century anatomist de Graaf). During the period of follicle growth, the primary oocyte, which like any other female body cell contains 46 chromosomes (including two X chromosomes), divides into two new cells of very unequal size: a relatively large secondary oocyte and a minute so-called polar body. In this division, the 46 chromosomes are split apart, and half of them are allotted to each of the new cells. Thus, the secondary oocyte as well as the polar body each contain only 23 chromosomes (including one X chromosome).

The polar body dies and disintegrates. Only the secondary oocyte is destined for further maturation. First, it floats freely inside the growing follicle which contains fluid. Eventually, the follicle bursts, releasing the secondary oocyte into the abdominal cavity. This release is known as ovulation. The secondary oocyte then enters the nearest Fallopian tube. Here it divides again into two new cells of unequal size: a relatively large ootid (mature ovum) and a minute second polar body. However, this time the division reproduces rather than splits the number of chromosomes. Thus, both of the new cells retain 23 chromosomes (including one X chromosome). This last division and the expulsion of the second polar body occur only after fertilization. While the second polar body dies just as the first one, the 23 chromosomes of the ootid unite with the 23 chromosomes of the spermatozoon, thus forming a new cell (the zygote) which again contains 46 chromosomes like all other cells of the body. (For details, see "Conception.")

The Production of Hormones

As described in a previous section, the female and male gonads (ovaries and testicles) also produce certain hormones. These gonadal hormones have been divided into female hormones (estrogens) and male hormones (androgens). However, these terms are somewhat misleading because both "female" and "male" hormones can be found in every female and male body. It is only the quantity of these hormones that differs. Before puberty, the estrogen and androgen levels in girls and boys are nearly equal. Then, during adolescence, the balance begins to shift. In the female body the estrogens rise to a much higher level than the androgens, and in the male body the androgens rise to a slightly higher level than the estrogens. In the female, the increase of estrogens during puberty helps to produce the secondary female sexual characteristics. (In the male, the increase of androgens helps to produce the secondary male sexual characteristics.)

In addition to estrogens (and androgens), the ovaries of a sexually mature female also produce a hormone called progesterone. The production of progesterone takes place mainly in association with the *corpus luteum* (Latin: yellow body) which is formed from the wall of the ruptured follicle after ovulation. During a women's fertile years, the estrogens as well as progesterone play an important role in her reproductive cycle. (For details, see "The Menstrual Cycle.")

There is still much to be learned about the nature and function of hormones in the human body. Nevertheless, a few basic facts have already been established: While the gonadal hormones are necessary for a young person's physical maturation, they are not essential for the continued sexual activity of adults. In other words, females and males need their gonadal hormones during adolescence to develop their full sexual potential. However, once the potential has been attained, they can function sexually without these hormones. Therefore, a woman who approaches menopause does not have to fear that she will lose her sexual responsiveness. Even when her ovaries have ceased their hormone production, she can continue her sexual activities as before. The same is also true, of course, for a woman who has to have her ovaries surgically removed for reasons of illness. (For details, see "The Role of Hormones.")

The Fallopian Tubes

The Fallopian tubes (named after the 16th-century anatomist Fallopius) lead from the ovaries to the uterus. They are also sometimes called oviducts (Latin: paths of eggs), a term that accurately describes their function. They provide a passageway for the egg down to the area where it could implant in case of a fertilization. (They also provide a passageway for sperm cells swimming upward from the uterus trying to reach the egg.) The wide ovarian end of a Fallopian tube has finger-like extensions called *fimbriae* (singular: *fimbria*) which move across the surface of the ovary; the uterine end leads directly into the inside of the uterus.

The fertilization of an egg normally occurs in the upper part of a Fallopian tube. Inside the tube, there are innumerable hair-like growths called *cilia*

(singular: *cilium*) whose movements, together with muscular contractions of the tubal wall, sweep the egg toward the uterus. (Inside the male vas deferens, the sperm cells are transported the same way since they are still unable to move by themselves at that point.)

The Uterus

The uterus (Latin: womb) is a muscular organ which is situated between and slightly below the ovaries, approximately in the center of the lower abdomen. The shape of the uterus, which is about 3 inches long, resembles that of a small pear turned upside down. The Fallopian tubes enter the uterus on either side near the top. The wide upper part, known as the body of the uterus, is usually tilted forward over the dome of the urinary bladder, and it is separated from the narrow lower part by a slight constriction. This lower part is called the cervix or neck of the uterus, and it ends in the deep portion of the vagina. The cervix contains a small opening through which sperm cells can travel from the vagina into the uterus. However, except for a certain period during ovulation, the cervical opening is plugged by an impenetrable mucus.

The thick walls of the uterus are made up of three layers: the external cover called the perimetrium, the middle or muscular layer called the myometrium, and the inner layer called the endometrium. This endometrium consists of special tissue which thickens every month as the uterus prepares for the possible implantation of a fertilized egg. (Also see "Conception.") If no implantation occurs, the endometrium deteriorates and is discharged through the cervix and the vagina during menstruation. (See "The Menstrual Cycle.")

In case of a pregnancy, the uterus expands with the growing fetus. The extraordinary muscular structure of the myometrium not only allows for such vast expansion, but also provides the necessary pressure during labor when the fetus is finally expelled. (See "Birth.")

The uterine muscles also contract during orgasm. (For details, see "The Female Sexual Response.")

The Vagina

The vagina (Latin: sheath) is a muscular tube about 3½ inches long extending from the cervix to an external opening which is part of the vulva.

The vagina serves three main functions:

- It provides a passageway for the menstrual flow from the uterus to the outside. (See "The Menstrual Cycle.")
- It serves as a receptacle for a man's penis and his ejaculated sperm which then may move on through the cervix (see "Conception").
- It provides a passageway for the baby during birth from the uterus to the outside. (See "Birth.")

Under ordinary circumstances, the vagina is a collapsed tube, i.e., more a potential than actual space. Its inner surface, like that of the mouth, hosts

different kinds of organisms which live in a healthy ecological balance. This balance can be upset, however, as a result of chemical interference. For this reason, vaginal sprays and douches should be avoided. The vagina cleanses itself with its own secretions. It also possesses a special protection against infection. (For vaginal infections and infestations, see "Venereal Diseases.")

The vaginal walls, which lie close together, contain mucous crypts and many blood vessels, but no glands and few nerve endings. (See also "The Female Sexual Response.") During sexual excitement, these walls secrete a watery substance which serves as a lubricant during coitus. Without such lubrication, the insertion of a penis could be painful to both the woman and the man. (See "Pain During Sexual Intercourse.")

Some women also expel some fluid from the urethra during orgasm. In the past, it was often assumed that the fluid could only be urine, and this caused the women some embarrassment. Sometimes another explanation was given: The fluid must have come from the vagina itself, perhaps as sudden excessive lubrication or as secretion from the Bartholin's glands. However, both explanations were wrong: The fluid did indeed come from the urethra, but it was not urine. Recent research suggests that the fluid is secreted by a system of urethral (or paraurethral) glands, i.e., glands which surround the urethra and open into it. This system of glands is more developed in some women than in others. In any case, it corresponds to the prostate in males, which also surrounds the urethra. Some researchers have therefore gone so far as to speak of a "female prostate." By the same token, the expulsion of fluid from this glandular system during orgasmic contractions has been called "female ejaculation," especially since the fluid itself has been shown to be similar to male prostatic fluid. (There are no sperm cells in these "female ejaculations", of course.)

While only relatively few women "ejaculate" in this sense, many more (perhaps all) have a certain sensitive spot, a cluster of tissue surrounding the urethra, which can be felt and stimulated through the anterior vaginal wall. This tissue (which is probably identical or at least connected with the system of urethral glands) first swells under intense stimulation and then contributes to a specially intense orgasmic release. Anatomically, this sensitive area has now become known as the "Grafenberg spot," after Ernest Grafenberg who first described it in 1950.

The vagina adjusts to the size of any inserted penis, large or small. However, that portion of the vagina which lies closest to the external opening may, in some cases, become too relaxed for the preference of either sexual partner. This can happen after childbirth, for instance, or simply as a result of the aging process. Conversely, it is also possible for the vaginal entry to become so tense and tight that it cannot be penetrated. Such a vaginal spasm is called vaginismus. In either case, it should be remembered that a woman can attain a great deal of control over the function of her vaginal muscles, and that they can be developed by appropriate exercises. Some of these exercises, the so-called Kegel exercises, can easily be performed at all times, anywhere. They are described in another section of this book. (See "Sexual Dysfunction in Women—Absence of Orgasm.")

SOME HOMOLOGOUS STRUCTURES IN THE FEMALE AND MALE SEXUAL SYSTEMS

Before a baby boy is born, testosterone (a male hormone) transforms his originally undifferentiated embryo, leading to the development of a male body with male sex organs. In case of a baby girl, the absence of testosterone at this developmental stage lets the embryo grow "automatically" into a female body with female sex organs. However, since both male and female sex organs derive from the same embryonic cell mass, they still correspond to each other or, in scientific language, are "homologous."

FEMALE	MALE
Ovaries	Testicles
Urethra	Prostatic urethra
Labia minora (minor lips)	Urethral tube of penis
Labia majora (major lips)	Scrotum
Clitoris	Penis
Bartholin's glands	Cowper's glands
Urethral glands ("female prostate")	Prostate

THE MENSTRUAL CYCLE

A woman becomes capable of reproduction during puberty and then loses this capacity in her early fifties. However, even in her fertile years she can conceive only during a certain time once a month when one of her ovaries releases an egg. The monthly recurrence of this event, together with other regular bodily changes, constitute the female reproductive cycle. Its most obvious external sign is menstruation (monthly bleeding). For this reason, the reproductive cycle may also be called menstrual cycle. Indeed, this latter term has the advantage of referring to a concrete experience which is familiar to practically all women, including those who do not reproduce.

A girl's first menstruation (also called menarche) usually occurs between the ages of 11 and 13. However, the second menstruation may very well be much farther away than just another month. During adolescence, menstrual cycles are rather irregular. It is only later that some definite pattern is established. In a mature woman, menstrual cycles usually last between 28 and 35 days. Still, some irregularity is always possible and quite normal. The irregularity increases again as the woman grows older. Finally, after menopause, her menstruations cease altogether.

In scientific textbooks, the menstrual cycle is usually divided into two, three, four, or more different phases. Such divisions, while always somewhat arbitrary, can nevertheless aid in understanding the biological processes involved. For the purposes of the present volume, a division into three phases seems adequate.