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  - **A CLOSER LOOK:** Where “Morning Practice” Is the Female Orgasm
- **Sexual Arousal and Response—The 3 R’s: Reflect, Recite, and Review**
  - Reflect
  - Recite
  - Review
Which of the following statements are the truth, and which are fiction? Look for the Truth-or-Fiction icons on the pages that follow to find the answers.

1. The ancient Romans were so obsessed with offensive odors that they perfumed their horses.  
   
2. The menstrual cycles of women who live together tend to become synchronized.  
   
3. Strippers earn higher tips when they are ovulating.  
   
4. The primary erogenous zone is the brain.  
   
5. “Spanish fly” will not turn your date on, but it may cure his or her warts.  
   
6. Electrical stimulation of certain areas in the human brain can yield sensations similar to those of sexual pleasure and gratification.  
   
7. Normal men produce estrogen, and normal women produce androgens.  
   
8. Written descriptions of men’s and women’s experiences during orgasm cannot be differentiated.  
   
9. Orgasms attained through sexual intercourse are more intense than those attained through masturbation.
You have probably heard about the birds and the bees. How about the buds and the bees? It may be that we should cover our children’s eyes when bees are at work in the yard. Researchers at the Australian National University have learned that bees who land on certain flowers are seeking something other than pollen. It turns out that some plants emit chemical secretions that mimic chemical signals secreted by female bees (“Australia scientists,” 2000). As a result, male bees try to mate with these plants. As a side effect, the bees transfer pollen from one plant to another, facilitating fertilization and the survival of these species of plants.

In case you are wondering, there is no evidence that these plants are “trying” to dupe the bees. Plants do not think, after all. It just happens, evolutionarily speaking, that whatever genes contribute to the development of these chemical secretions are likely to be transmitted to the next generation.

The kinds of plants that are “in on” the signal scam are orchids. One type is found in Europe, and nine types are found in Australia, where the bees are apparently especially active. These orchids produce the same hydrocarbon compounds that are found in chemicals secreted by the female bee.

These chemicals are called pheromones; they are odorless chemicals that are nevertheless detected in the same way that animals detect odors—by sampling molecules of substances in the air. Lower animals use pheromones to stimulate sexual response, organize food gathering, maintain pecking orders, sound alarms, and mark territories (Cutler, 1999; Wyatt, 2003). Pheromones induce mating behavior in insects such as bees.

In the case of the orchids, the power of the pheromones apparently overrides bees’ vision. Even so, one of the researchers noted that “the bees will . . . only try mating with the flowers a few times each” (cited in “Australia scientists,” 2000). Better to learn late than never.

What turns you on? What springs your heart into your mouth, tightens your throat, and opens the floodgates into your genitals? The sight of your lover undressing, a photo of Chris Pine or Megan Fox, a sniff of musky perfume, a sip of wine?

Many factors contribute to sexual arousal. Some people are aroused by magazines with photographs of nude or seminude models that have been airbrushed to perfection. Some need only to imagine Hollywood’s latest sex symbol. Some become aroused by remembrances of past lovers. Some are stimulated by sexual fantasies of flings with strangers.

People vary greatly in the cues that excite them sexually and in the frequency with which they experience sexual thoughts and feelings. Some young people seem perpetually aroused or arousable. Some people rarely or never entertain sexual thoughts or fantasies.

In this chapter we look at factors that contribute to sexual arousal and the processes that relate to sexual response. Because our experience of the world is ini-

**Pheromones** Chemical substances secreted externally by certain animals, which convey information to, or produce specific responses in, other members of the same species.
WE COME TO APPREHEND THE WORLD around us through our senses—vision, hearing, smell, taste, and the skin senses, which include that all-important sense of touch. Each of the senses plays a role in our sexual experience, but some senses play larger roles than others.

**Vision: The Better to See You With**

Visual cues can be sexual turn-ons. We may be turned on by the sight of a lover in the nude, disrobing, or dressed in evening wear. Lingerie enhances women’s sex appeal by strategically concealing and revealing body parts. Men appear to be more responsive to visual stimuli than women, although women are also clearly attuned to appealing eyefuls—and what they mean to them (Rupp & Wallen, 2009).

One study found that women tend to dress and ornament themselves in more appealing ways when they are in the fertile phase of their ovulatory cycle (Haselton et al., 2007). Forty-two judges selected photos of women as “trying to look more attractive” in their fertile (59.5%) phase as compared with their luteal phase (40.5%). Other research shows that men’s “mate-retention efforts” increase as their partners are approaching ovulation, and perhaps the men are signaled, at least in part, by their partners’ appearance (Haselton et al., 2007).

Science has endorsed what lingerie companies have known for centuries—that women seeking male interest might do well to clothe themselves in red. Research shows that men are more likely to consider women dressed in red as more sexually desirable and attractive, although men seem to be unaware of this colorful effect (Elliot & Niesta, 2008). But it’s interesting to note that males in the study did not rate women dressed in red as kinder, more intelligent, or more likeable.

Some couples find it arousing to observe themselves making love in an overhead mirror or on videotape. Some people find sexually explicit movies arousing. Others are bored or offended by them. Although both males and females can be sexually aroused by visually mediated erotica (a technical term for “porn flicks”), men are more interested in them (Hamann et al., 2004; Schaller & Traen, 2008).

**Smell: Does the Nose Know Best?**

Although the sense of smell plays a lesser role in governing sexual arousal in humans than in lower mammals, odors can be sexual turn-ons or turn-offs. Perfume companies, for example, bottle fragrances purported to be sexually arousing.

Most Westerners prefer their lovers to be clean and fresh smelling (Boston Women’s Health Book Collective, 2005). People in U.S. society have learned to remove or mask odors by the use of soaps, deodorants, and perfumes or colognes. The ancient Egyptians invented scented bathing to rid themselves of offensive odors (Illes, 2000).

Making Sense of Sex: The Role of the Senses in Sexual Arousal

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Truth or Fiction Revisited: The ancient Romans of the upper classes also had a passion for perfume. They would bathe in fragrances and even dab their horses and household pets.

Inclinations to find underarm or genital odors offensive may reflect cultural conditioning rather than biological predispositions. In some societies, genital secretions are considered aphrodisiacs. And the underarms? Check out the nearby “A Closer Look” (on page 134) on pheromones for possible answers.

MENSTRUAL SYNCHRONY Exposure to other women’s sweat can modify a woman’s menstrual cycle (Morofushi et al., 2000). How does this phenomenon happen? Let us examine some research on the subject and see.

In one study, women exposed to underarm secretions from other women, which contain steroids that may function as pheromones, showed converging shifts in their menstrual cycles (Preti et al., 1986). Similar synchronization of menstrual cycles has also been observed among women who share dormitory rooms. In another study, 80% of the women who dabbed their upper lips with an extract of perspiration from other women began to menstruate in sync with the cycles of the donors after about three menstrual cycles (Cutler, 1999). A control group, women who dabbed their lips with alcohol, showed no changes in their menstrual cycles. In yet another study from this research group, the length of the cycles of women with unusually short or long cycles began to normalize when they were exposed to an extract of male underarm perspiration (Preti et al., 1986). Truth or Fiction Revisited: Therefore, it is true that the menstrual cycles of women who live together tend to become synchronized—so long as the women’s cycles are not being regulated by birth-control pills.

ATTRACTION TO—OR DISLIKE OF—BODY ODORS OF HETEROSEXUAL MALES AND FEMALES VERSUS GAY MALES AND LESBIANS There is reason to believe that body odors play a role in the selection of sex partners (Preti et al., 2003; T. Wyatt, 2003). Yolanda Martins, George Preti, Charles Wysocki, and...
their colleagues (2005) hypothesized that preferences for axillary (underarm) odors would be related to people’s sexual orientation: heterosexual male or female, and gay male or lesbian. They collected samples of axillary odors from 24 volunteers—6 exclusively male heterosexual and 6 exclusively female heterosexual, and 6 exclusively gay male and 6 exclusively lesbian, according to the Kinsey heterosexuality–homosexuality scale described in Figure 10.1 (see page 283).

The researchers had a number of interesting findings. For example,

- Heterosexual males and females, and lesbians preferred axillary odors taken from heterosexual males over those taken from gay males.
- Gay males preferred axillary odors taken from other gay males.
- Heterosexual males and females and lesbians aged 25 and above preferred axillary odors taken from lesbians to those from gay males.
- When axillary odors of heterosexual females were compared to those of lesbians, all groups except for heterosexual males preferred the odors from heterosexual females.
- Heterosexual males preferred the odor from lesbians over the odor taken from gay male donors.

The researchers suggest that the data show that gay males and lesbians may produce axillary odors that can be distinguished from those of heterosexuals. It would also appear that gay males may perceive these typical odorants differently from the way in which heterosexual males do. We can note, at least in the few studies that have investigated the relationships between body odor and sexual orientation, that gay males are most likely to be attracted to the body odors of other gay males, and that heterosexual males are least likely to prefer the body odors of gay males.

The Skin Senses: Sex as a Touching Experience

Our skin senses enable us to sense pain, changes in temperature, and pressure (or touch). Whatever the roles of vision and smell in sexual attraction and arousal, the sense of touch has the most direct effects on sexual arousal and response. Any region of that sensitive layer we refer to as skin can become eroticized. The touch of your lover’s hand on your cheek, or your lover’s gentle massage of your shoulders or back, can be sexually stimulating.

EROGENOUS ZONES

Erogenous zones are parts of the body that are especially sensitive to tactile sexual stimulation—to strokes and other caresses. Primary erogenous zones are erotically sensitive because they are richly endowed with nerve endings. Secondary erogenous zones are parts of the body that become erotically sensitized through experience.

CRITICAL THINKING

As critical thinkers read the study by Martins, Preti, Wysocki, and their colleagues (2005), they will recognize the importance of remaining open-minded about the interpretation of the study’s results. For example, does the study show that preferences for body odors causes sexual attraction or sexual orientation? Could it also be that sexual experiences give rise to preferences for certain body odors? Or is it possible that sexual orientation gives rise both to patterns of sexual attraction and preferences for body odors? Final question: Might the results of the study have any implications for the origins of homophobia?

Erogenous zones

Parts of the body that are especially sensitive to tactile sexual stimulation.

Primary erogenous zones

Erogenous zones that are particularly sensitive because they are richly endowed with nerve endings.

Secondary erogenous zones

Erogenous zones that become especially sensitive through experience.
The Search for a “Magic” Love Potion: On the Threshold?

Pheromones have been found across the animal kingdom, sending messages between courting lobsters, alarmed aphids, suckling rabbit pups, mound-building termites and trail-following ants.

—T. D. Wyatt (2009)

For centuries people have searched for a love potion—a magical formula that could make other people fall in love with you or be strongly attracted to you. But some scientists suggest that such potions may already exist in the form of chemical secretions known as pheromones. Pheromones may enhance people’s moods, have effects on fertility, and provide a basis for sexual communication below the level of conscious awareness (T. Wyatt, 2009).

Pheromones are odorless chemicals that in many animals are detected through a “sixth sense”—the vomeronasal organ (VNO). People possess VNOs in the mucous lining of the nose (Touhara & Vosshall, 2009; T. Wyatt, 2009). During prenatal development, the VNO shuttles sex hormones into the brain, aiding in the sexual differentiation of the embryo (Rodriguez et al., 2000). But before birth, the human VNO shrinks, and some researchers suggest that it stops working (Kouros-Mehr et al., 2001). But if it does continue to work, it might detect pheromones and direct information about them to the hypothalamus, where they might affect sexual response (T. Wyatt, 2003). Infants apparently use pheromones to recognize their mothers, and adults might respond to them in seeking a mate (Martins et al., 2005). Male rodents such as mice are extremely sensitive to several kinds of pheromones (Leinders-Zufall et al., 2000). Male rodents show less sexual arousal when their sense of smell is blocked, but the role of pheromones in sexual behavior becomes less vital as one moves upward through the ranks of the animal kingdom.

Only a few years ago, most researchers did not believe that pheromones played a role in human behavior, but today the issue has attracted new interest. In a typical study, Winnifred Cutler and her colleagues (1998) had heterosexual men wear a suspected male pheromone, whereas a control group wore a placebo. The men using the pheromone increased their frequency of sexual intercourse with their female partners but did not increase the frequency of masturbation. The researchers conclude that the substance increased the sexual attractiveness of the men to their partners, although they do not claim that it directly stimulated sexual behavior.

Experiments that expose men and women to suspected pheromones (androstandiendone produced by males and estratetraenol produced by females) find that they enhance the moods of women but not of men; the substances also apparently reduce feelings of nervousness and tension in women, but again, not in men (Jacob et

A Touching Experience. The sense of touch is intimately connected with sexual experience. The touch of a lover’s hand on the cheek, or a gentle massage, can be sexually stimulating. Certain parts of the body—called erogenous zones—have special sexual significance because of their response to erotic stimulation.
Primary erogenous zones include the genitals; the inner thighs, perineum, buttocks, and anus; the breasts (especially the nipples); the ears (particularly the earlobes); the mouth, lips, and tongue; the neck; the navel; and, yes, the armpits. Preferences vary somewhat from person to person, reflecting possible biological, attitudinal, and experiential differences. Areas that are exquisitely sensitive for some people may produce virtually no reaction, or discomfort, in others. Many women, for example, report little sensation when their breasts are stroked or kissed. Many men are uncomfortable when their nipples are caressed. On the other hand (or foot), many people find the areas between their toes sensitive to erotic stimulation and enjoy keeping a toehold on their partners during coitus.

Secondary erogenous zones become eroticized through association with sexual stimulation. For example, a woman might become sexually aroused when her lover gently caresses her shoulders, because such caresses have been incorporated into the couple’s lovemaking. A few of the women observed by Masters and Johnson (1966) reached orgasm when the smalls of their backs were rubbed.

How Much Sexual Communication Is Occurring below the Level of Conscious Awareness? Research suggests that underarm secretions may make people more sexually attractive, even when others are unaware of sensing them. Are they drawn to each other’s personal traits or to their pheromones?

CRITICAL THINKING
If pheromones are shown to enhance sexual arousal, would it be “fair” to wear a pheromone on a date? Is using perfume or cologne the equivalent of using a pheromone to enhance one’s sexual attractiveness?

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CHAPTER 5  ●  Sexual Arousal and Response

Strippers: A Treat for the Eyes or the Nose?

Many patrons of bars and strip clubs say they go “just to see what’s going on” (or off?). But it could also be that many of them go to titillate their senses of smell, especially during lap dances. A study published in *Evolution and Human Behavior* (Miller et al., 2007) found that strippers’ tips were related to their “time of month.”

**Truth or Fiction Revisited:** As you can see in Figure 5.1, when strippers were ovulating, they made twice as much money in tips as when they were menstruating—and one and one-half the amount of money they made when they were neither ovulating nor menstruating. When women are ovulating, they are usually somewhat more interested in sex, and it is possible that they subtly communicated their interest through their movements. However, it is also possible that they emitted olfactory cues that were more arousing to their patrons, who, in turn, showed their enhanced appreciation via their wallets. It could also be that subliminal menstrual odors which, in biological terms, are a sign of an infertile period of time, communicated unavailability at some fundamental sexual level.

**Strippers and the Time of the Month.** Strippers earn higher tips when they are ovulating. It is possible that male customers sense their time of the month through the sense of smell. But as critical thinkers, can you think of alternate explanations?

**Figure 5.1 ● Strippers’ Time of the Month and Amount of Tips.** Strippers earned twice as much when they were ovulating as compared to when they were menstruating.


People are also highly responsive to images and fantasies. This is why the brain is sometimes referred to as the primary sexual organ or an erogenous zone. Some women report reaching orgasm through fantasy alone (Kinsey et al., 1953). Men regularly experience erection and nocturnal emissions (“wet dreams”) without direct stimulation of the genitals.

**Truth or Fiction Revisited:** The brain is not an erogenous zone, because it is not stimulated directly by touch. The brain processes tactile information from the skin, but it does not have sensory neurons to directly gather this information itself. However, the brain can certainly pave the path toward erotic sensations through the production of fantasy, erotic memories, and other thoughts.
**Taste: On Savory Sex**

Taste appears to play a minor role in sexual arousal and response. Some people are sexually aroused by the taste of genital secretions, such as vaginal secretions or seminal fluid. We do not know, however, whether these secretions are laced with chemicals that have biologically arousing effects or whether arousal reflects the meaning that these secretions have to the individual. That is, we may learn to become aroused by, or to seek out, flavors or odors that have been associated with sexual pleasure. Others are turned off by them.

**Hearing: The Better to Hear You With**

The sense of hearing also provides an important medium for sexual arousal and response. Like visual and olfactory cues, sounds can be turn-ons or turn-offs. The sounds of one’s lover, whether whispers, indications of pleasure, or animated sounds that may attend orgasm, may be arousing during the heat of passion. For some people, key words or vocal intonations may become as arousing as direct stimulation of an erogenous zone. Many people are aroused when their lovers “talk dirty.” Spoken vulgarities spur their sexual arousal. Others find vulgar language offensive.

Music can contribute to sexual arousal. Music can relax us and put us “in the mood” or have associations (“They’re playing our song!”). Many couples find background music “atmospheric”—a vital accouterment of lovemaking.

Sounds can also be sexual turnoffs. Most of us would find funeral music a damper on sexual arousal. We may also be inhibited by scratchy, unnerving voices. Heavy metal rock might be a sexual turn-off to many (are your authors showing their age?), but it could help set the right tone for others.

**Aphrodisiacs: Of Spanish Flies and Rhino Horns**

_Aphrodisiac_ enters or increases one’s capacity for sexual pleasure or response. You may have heard of “Spanish fly,” an alleged aphrodisiac once extracted from a Spanish beetle. (The beetle from which it was taken, _Lytta vesicatoria_, is near extinction.) A few drops in a date’s drink were believed to make you irresistible. Spanish fly is but one of many purported aphrodisiacs. It is toxic, however, not sexually arousing. Spanish fly is now synthesized—but not as an aphrodisiac.

**Truth or Fiction Revisited:** It is true that Spanish fly will not turn your date on but it might cure his or her warts. Spanish fly contains _cantharidin_, a skin irritant that is used medically to burn off warts. If it can burn off warts, consider the damage it can do when taken internally. It irritates the urinary tract and can damage tissue or cause death (Bengoa Vallejo et al., 2008). It inflames the urethra, producing a burning sensation in the penis that is sometimes misinterpreted as sexual feelings.
YSEX—That Is, Why Do People Engage in Sexual Intercourse? Is the Answer (Always) Obvious?

Do you see yourself as engaging in sexual intercourse to get a job or a raise? To be “used” or degraded? Because you lost a bet? Or to feel closer to God? These are infrequent reasons for having sex, but some people have engaged in intercourse because of them.

Cindy Meston and David Buss (2007) sought to learn about the most common—and least common—reasons for sex, to see if they were consistent with pervasive gender roles and what they might suggest about theories of human sexuality. To do so, they created a questionnaire with the intriguing title, YSEX (“Why Sex?”) and administered it to college students.

They created their questionnaire by asking students and community members to list all the reasons they could think of why they had ever had sex, or why someone they knew had reported having sex. The researchers obtained a pool of 715 questions, which they whittled down to 237 by excluding items that were highly similar to others. They then had 1,549 students take the questionnaire in exchange for course credit. The sample was 62% European American, 15% Asian American, 15% Latino and Latina American, 4% African American, and 1% Native American. Respondents ranged in age from 16 to 42, but the mean age was 19—basically college sophomore status.

The following nine themes characterized the most common reasons among both men and women for having sex: (1) feelings of attraction, (2) desire for physical pleasure, (3) expression of feelings of love, (4) feeling desired by the other person, (5) desire to deepen the relationship, (6) novel experience, (7) celebration of special occasion, (8) opportunity, and (9) seeming to “just happen.” People were least likely to have sex to hurt their partners (that is, cheating on them), to get a job or a promotion, to be more popular, to get rid of a headache or cramps, or because of pressure or a sense of duty. Some reasons were unexpected, to put it mildly: “I wanted to feel closer to God.”

There were some gender differences: Men were significantly more likely than women to have sex for physical reasons (physical appearance, an attractive face) and because of sheer opportunity. Men’s greater emphasis on physical reasons seems to support the view that men are more responsive to visual cues. Men were also more interested in sex for bragging rights, purposes of “conquest,” and enhancing their social status among other men. Women exceeded men on having sex because of desire to feel feminine (no surprise) and to express love. If the sample had been older, perhaps fewer men would have been interested in bragging rights and conquests. But all in all, the responses were consistent with traditional gender roles that portray men as sexual initiators and women as “gate keepers.”

Further statistical methods (factor analysis) grouped the items into four areas: physical reasons for having sex, goal attainment, emotional reasons, and insecurity. Physical reasons included the partner being attractive, and desires for pleasure, excitement, and orgasm. Emotional reasons included love, passion, and gratitude.

The researchers concluded that sexual intercourse is motivated by complex and multifaceted reasons. Would the same reasons be found in different cultures? Do they change over the lifespan? Do uncommon reasons, such as the desire to destroy another person’s relationship have an impact that is disproportionate to their low incidence? These are questions that researchers will be seeking to answer.

We should also be concerned about an expectancy, or placebo effect, when evaluating the effectiveness of a purported aphrodisiac (Downs & Nazario, 2003). The belief that a substance has sexually stimulating effects may itself inspire sexual excitement. If a person tries a supposed aphrodisiac and feels sexually aroused, the person may well attribute the turn-on to the effects of the substance, even if the substance had no direct effect on sex drive.

Foods that in some way resemble male genitals have now and then been considered aphrodisiacs. They include oysters, clams, bull’s testicles (“prairie oysters”), tomatoes, and “phallic” items such as celery stalks, bananas, and even ground-up rhinoceros, reindeer, and elephant horns (which is one derivation of the slang term “horny”). Even potatoes—both white and sweet—have been held to be aphrodisi-
Aphrodisiacs: Of Spanish Flies and Rhino Horns

None of these foods or substances has been shown to be sexually stimulating, however. Sadly, myths about the sexually arousing properties of substances drawn from rhinoceroses or elephants may be contributing to the rapidly diminishing numbers of these animals (Ascher, 2006).

Other drugs and psychoactive substances may have certain effects on sexual arousal and response. The drug arginine, an amino acid extracted from the African yohimbe tree, does stimulate blood flow to the genitals. However, its effects are limited and unreliable (Downs & Nazario, 2003).

Amyl nitrate (in the form of “snappers” or “poppers”) has been used mostly by gay men (and by some heterosexuals) in the belief that it heightens sensations of arousal and orgasm. Poppers dilate blood vessels in the brain and genitals, producing sensations of warmth in the pelvis and possibly facilitating erection and prolonging orgasm. Amyl nitrate does have some legitimate medical uses, such as helping reduce heart pain (angina) among cardiac patients. It is inhaled from ampules that “pop” open for rapid use when heart pain occurs. Poppers can cause dizziness, fainting, and migraine-type headaches, however. They should be taken only under a doctor’s care for a legitimate medical need, not to intensify sexual sensations.

The drug Viagra was originally developed as a treatment for angina (heart pain) because it increases the blood flow to the heart—modestly. However, it also dilates blood vessels in the genital organs, thereby facilitating vasocongestion and erection—and, according to some reports, sexual response in women as well ( Slovenko, 2001). Viagra and similar drugs—Levitra and Cialis—are treatments for erectile dysfunction (also termed impotence). Is Viagra also an aphrodisiac? Apparently not. Although Viagra facilitates erection, it still takes a sexual turn-on for erection to occur.

But certain drugs do appear to have aphrodisiac effects, apparently because they act on the brain mechanisms controlling the sex drive. For example, drugs that affect brain receptors for the neurotransmitter dopamine, such as the anti-depressant drug bupropion (trade name Wellbutrin) and the drug L-dopa used in the treatment of Parkinson’s disease, can increase the sex drive (Saks, 2008).

The most potent chemical “aphrodisiac” may be a naturally occurring substance in the body, the male sex hormone testosterone. It is the basic fuel of sexual desire in both males and females (Basson et al., 2009).

The safest and perhaps most effective method for increasing the sex drive may not be a drug or substance but proper diet and exercise. Regular exercise not only enhances general health but it also boosts energy and increases the sex drive in both sexes. Perhaps the strongest aphrodisiac is novelty. Partners can invent new ways of sexually discovering one another. They can make love in novel places, experiment with different techniques, wear provocative clothing, share or enact fantasies, or whatever their imaginations inspire.

Anaphrodisiacs

Aphrodisiacs are thought to stimulate a sexual response. Anaphrodisiacs would have the opposite effect. These include substances such as potassium nitrate (saltpeter), which have been considered inhibitors of sexual response, or anaphrodisiacs. Saltpeter, however, only indirectly dampens sexual arousal. As a diuretic that can increase the need for urination, it may make the thought of sex unappealing, but it does not directly dampen sexual response.

Other chemicals do dampen sexual arousal and response. Tranquilizers and central nervous system depressants, such as barbiturates, can lessen sexual desire and impair sexual performance. These drugs may paradoxically enhance sexual arousal.
in some people, however, by lessening sexual inhibitions or the fear of possible repercussions from sexual activity. Anti-hypertensive drugs, which are used in the treatment of high blood pressure, may produce erectile and ejaculatory difficulties in men and reduction of sexual desire in men and women. Certain anti-depressant drugs, such as fluoxetine (brand name Prozac), amitriptyline (brand name Elavil), and imipramine (brand name Tofranil), appear to dampen the sex drive (Kennedy & Rizvi, 2009). Anti-depressants may also impair erectile response and delay ejaculation in men and orgasmic responsiveness in women (Kennedy & Rizvy, 2009). (Because they delay ejaculation, some of these drugs are used to treat premature ejaculation.)

Nicotine, the stimulant in tobacco smoke, constricts the blood vessels. Thus it can impede sexual arousal by reducing the capacity of the genitals to become engorged with blood. Chronic smoking can also reduce the blood levels of testosterone in men, which, in turn, can lessen sex drive or motivation.

Antiandrogen drugs may have anaphrodisiac effects. They have been used in the treatment of deviant behavior patterns such as sexual violence and sexual interest in children, with some promising results (e.g., Roesler & Witztum, 2000).

Psychoactive Drugs

Psychoactive drugs, such as alcohol and cocaine, are widely believed to have aphrodisiac effects. Do any psychoactive drugs stimulate a sexual response? Perhaps some do, but their effects may also reflect our expectations of them, or their effects on sexual inhibitions, rather than direct stimulation of sexual response.

ALCOHOL Small amounts of alcohol are stimulating, but large amounts curb sexual response. This fact should not be surprising because alcohol is a depressant; it reduces central nervous system activity. Large amounts of alcohol can severely impair sexual performance in both men and women.

People who drink moderate amounts of alcohol may feel more sexually aroused because of their expectations about alcohol, not because of its chemical properties (George et al., 2000). That is, people who expect alcohol to enhance sexual responsiveness may act the part. Expectations that alcohol serves as an aphrodisiac may lead men with problems achieving erection to turn to alcohol as a cure. The fact is that alcohol is a depressant, and a few drinks can reduce sexual potency rather than restore it.

Alcohol may also lower sexual inhibitions, because it allows us to ascribe our behavior to the effects of the alcohol rather than to ourselves. Alcohol is connected with a liberated social role and thus provides an excuse for dubious behavior. “It was the alcohol,” people can say, “not me.” People may express their sexual desires and do things when drinking that they would not do when sober. For example, a person who feels guilty about sex may become sexually active when drinking because he or she can later blame the alcohol.

Binge drinking—having five or more drinks in a row for a male, or four or more for a female—is connected with high-risk sexual behavior, sexual promiscuity, and sexual assault (Hutton, 2008; Randolph et al., 2009; Wong et al., 2008). Nevertheless, more than two out of five college students binge at least twice a month, and half this number binge three or more times every two weeks (Johnston et al., 2005; National Institute of Alcohol Abuse and Alcoholism, 2005).

Alcohol can also induce feelings of euphoria. Euphoric feelings may enhance sexual arousal and also wash away qualms about expressing sexual desires. Alcohol also
What Are the Effects of Alcohol on Sexual Behavior? Small doses of alcohol can be stimulating, induce feelings of euphoria, and lower inhibitions, all of which could be connected with sexual interest and could facilitate social and sexual behavior. Alcohol also reduces fear of consequences of engaging in risky behavior—sexual and otherwise. Alcohol also provides an excuse for otherwise unacceptable behavior, such as sexual intercourse on the first date (or upon a casual meeting). That is, drinkers can say, “It was the alcohol, not me.” Alcohol is also expected to be sexually liberating, and people often live up to social and cultural expectations. Yet, as a depressant drug, large amounts of alcohol will biochemically dampen sexual response.

appears to impair the ability to weigh information (“information processing”) that might otherwise inhibit sexual impulses (MacDonald et al., 2000; Steele & Josephs, 1990). When people drink, they may be less able to foresee the consequences of misconduct and less likely to ponder their standards of conduct.

HALLUCINOGENICS There is no evidence that marijuana and other hallucinogenic drugs directly stimulate sexual response. However, fairly to strongly intoxicated marijuana users claim to have more empathy with others, to be more aware of bodily sensations, and to experience time as passing more slowly. These sensations could heighten subjective feelings of sexual response, although some marijuana users report that it inhibits their sexual responsiveness (McCabe et al., 2005; van den Bree & Pickworth, 2005). The effects of the drug on sexual response may depend on prior experiences with it, attitudes toward it, and the amount used.

Other hallucinogens, such as LSD and mescaline, have also been reported by some users to enhance sexual response. Again, these effects may reflect dosage level, as well as expectations, user experiences, attitudes toward the drugs, and altered perceptions.

STIMULANTS Stimulants such as amphetamines (“speed,” “uppers,” “bennies,” “dexies”) have been reputed to heighten arousal and sensations of orgasm. High doses can give rise to irritability, restlessness, hallucinations, paranoid delusions, insomnia, and loss of appetite. These drugs generally activate the central nervous system but are not known to have specific sexual effects. Nevertheless, arousing the nervous system can contribute to sexual arousal (Palace, 1995). The drugs can also elevate the mood, and perhaps sexual pleasure is heightened by general elation.

Cocaine is a natural stimulant that is extracted from the leaves of the coca plant—the plant from which the soft drink Coca-Cola obtained its name. In fact, Coke—Coca-Cola, that is—contained cocaine as part of its original formula. Cocaine was removed from the secret formula in 1906 and replaced with extra caffeine.
The drug is ingested in various forms, snorted as a powder, smoked in hardened rock form (“crack” cocaine) or in a freebase form, or injected directly into the bloodstream in liquid form. Cocaine produces a euphoric rush, which tends to ebb quickly. Physically, cocaine constricts blood vessels (reducing the oxygen supply to the heart), elevates blood pressure, and boosts heart rate. There is also evidence that cocaine enhances sexual arousal in both males and females, in part by increasing levels of the neurotransmitter dopamine (Andersen et al., 2003; Andersen & Tufik, 2005; Festa et al., 2004).

Despite any positive effects on sexual arousal, high doses of stimulants can cause irritability, restlessness, hallucinations, paranoid delusions, insomnia, and loss of appetite. Use of crack cocaine is connected with a higher number of sex partners (Maranda et al., 2004).

**Sexual Response and the Brain: Cerebral Sex?**

**THE BRAIN MAY NOT BE AN EROGENOUS ZONE, but it plays a central role in sexual functioning (Fisher, 2000).** Direct genital stimulation may trigger spinal reflexes that produce erection in the male and vaginal lubrication in the female without the direct involvement of the brain. The same reflexes, however, may also be triggered by sexual stimulation that originates in the brain in the form of erotic memories, fantasies, visual images, and thoughts. The brain may also inhibit sexual responsiveness, as when we experience guilt or anxiety in a sexual situation, or when we suddenly realize in the midst of a sexual encounter that we have left the car lights turned on. Let us explore the brain mechanisms involved in sexual functioning.

Parts of the brain, in particular the cerebral cortex and the limbic system, play key roles in sexual functioning (see Figure 5.2). Cells in the cerebral cortex fire (transmit messages) when we experience sexual thoughts, images, wishes, fantasies, and the like. Cells in the cerebral cortex interpret sensory information as sexual turn-ons or turn-offs. The sight of your lover disrobing, the anticipation of a romantic kiss, a passing sexual fantasy, or an erotic photo can trigger the firing of cortical cells. These cells, in turn, transmit messages through the spinal cord that send blood coursing to the sex organs, leading to erection or vaginal lubrication. The cortex also provides the conscious sense of self. The cortex judges sexual behavior to be proper or improper, moral or immoral, relaxing or anxiety- or guilt-provoking.

Areas of the brain below the cortex, especially the limbic system, also play roles in sexual processes (Kimble, 1992). For example, when the rear part of a male rat’s hypothalamus is stimulated by an electrical probe, the animal mechanically runs through its courting and mounting routine. Klüver and Bucy (1939) found that destruction of areas of the limbic system triggered continuous sexual behavior in monkeys. Electrical stimulation of the hippocampus and septal nuclei produces erections in monkeys.

**Figure 5.2** Parts of the Brain Involved in Sexual Functioning. A view of the brain, split from top to bottom. Cells in the cerebral cortex transmit messages when we experience sexual thoughts and mental images. Cells in the cortex interpret sensory information as sexual turn-ons or turn-offs. The cerebral cortex may then transmit messages through the spinal cord that send blood coursing to the sex organs, leading to erection or vaginal lubrication. The limbic system lies along the inner edge of the cerebrum. When part of a male rat’s hypothalamus is electrically stimulated, the rat engages in its courting and mounting routine. Klüver and Bucy (1939) found that destruction of areas of the limbic system triggered continuous sexual behavior in monkeys. Electrical stimulation of the hippocampus and septal nuclei produces erections in monkeys.
Klüver and Paul Bucy of the University of Chicago in 1939. Klüver and Bucy reported that destruction of areas of the limbic system triggered persistent sexual behaviors that included masturbation and male–female and male–male mounting attempts. The monkeys even tried to mount the experimenters. For obvious ethical reasons, researchers have not injured or destroyed parts of people’s brains to observe the effects on humans.

Electrical stimulation of the hippocampus and septum of the limbic system can produce erections in laboratory monkeys (Ferris et al., 2004). Electrical stimulation of a pathway in the thalamus, moreover, can produce a seminal discharge in these monkeys—without erection. Stimulation of certain areas in the thalamus and hypothalamus may induce ejaculation. It remains to be seen how these findings will be useful with humans.

**On Pushing the Right Buttons: Are There Pleasure Centers in the Brain?**

Research with electrical probes suggests that “pleasure centers” may exist in and near the hypothalamus in other animals and perhaps even in people. Classic research found that when electrodes are implanted in certain parts of the limbic system, investigators find that laboratory animals such as rats (Olds, 1956; Olds & Milner, 1954) will repeatedly press controls to receive bursts of electricity. Of course we cannot know what the rats experience, but people report that stimulation of these so-called pleasure centers leads to feelings of sexual arousal and gratification.

Heath (1972) found that electrical stimulation of the septal region of the limbic system resulted in orgasmlike sensations in two people. Delgado (1969) reported that two female epileptic patients who received limbic stimulation as part of a diagnostic evaluation became sexually aroused by the stimulation:

[One] reported a pleasant tingling sensation in the left side of her body “from my face down to the bottom of my legs.” She started giggling and [stated] that she enjoyed the sensation “very much.” Repetition of these stimulations made the patient more communicative and flirtatious, and she ended by openly expressing her desire to marry the therapist. [The other patient reported] a pleasant sensation of relaxation and considerably increased her verbal output, which took on a more intimate character. [She] expressed her fondness for the therapist [whom she had just met], kissed his hands, and talked about her immense gratitude. (p. 145)

**Truth or Fiction Revisited:** It is apparently true that electrical stimulation of certain areas in the human brain can yield sensations similar to those of sexual pleasure and gratification. We might wonder whether we would bother to develop sexual relationships if such centers could be stimulated directly. But before you run to the store for electrodes, consider that few researchers suggest that we will someday replace lovers with electronic kits.

**Sex Hormones and Sexual Behavior**

*IN A TV SITUATION COMEDY,* a male adolescent was described as a “hormone with feet.” Ask parents why teenagers act the way they do, and you are likely to hear a one-word answer: hormones!
Hormones are chemicals that are secreted by the ductless glands of the endocrine system directly into the bloodstream. The word *hormone* derives from the Greek *horman*, meaning “to stimulate” or “to goad.” We could say that hormones very much goad us into sexual activity. Hormones also regulate various bodily functions, including growth and resistance to stress as well as sexual functions.

The hypothalamus and pituitary gland regulate gonadal secretion of sex hormones, specifically testosterone in males and estrogen and progesterone in females. At puberty a surge of sex hormones causes the blossoming of reproductive maturation: the sperm-producing ability of the testes in males and the maturation of ova and ovulation in females. Sex hormones released at puberty also cause the flowering of secondary sex characteristics. In males, the vocal cords lengthen (and the voice consequently lowers), and facial and pubic hair grow. In females, the breasts and hips become rounded with fatty tissue, and pubic hair grows.

### Organizing and Activating Influences

Sex hormones have organizing and activating effects on behavior. That is, they exert an influence on the type of behavior that is expressed (an organizing effect) and the frequency or intensity of the drive that motivates the behavior and the ability to perform the behavior (activating effects). For example, sex hormones predispose lower animals and possibly people toward stereotypical masculine or feminine mating behaviors (an organizing effect). They also facilitate sexual response and influence sexual desire (activating effects).

Although sex hormones clearly determine the sex of the sex partners many lower animals will seek, their roles in human sexual behavior may be relatively more subtle and are not as well understood. Much of our knowledge of the organizing and activating effects of sex hormones comes from research with other species in which hormone levels were manipulated by castration or injection. Ethical standards prohibit such research with human infants, for obvious reasons.

The activating effects of testosterone can be clearly observed among male rats. For example, males who are castrated in adulthood and thus deprived of testosterone discontinue sexual behavior. If they are given injections of testosterone, however, they resume stereotypical male sexual behaviors, such as mounting females.

In rats, testosterone apparently organizes or differentiates the brain in the masculine direction such that adult male rats display stereotypical masculine behaviors—including sniffing, especially sniffing females, and mounting females—upon activation by testosterone. Male fetuses and newborns normally have sufficient amounts of testosterone in their blood systems to organize their brains in the masculine direction. Female fetuses and newborns normally have lesser amounts of testosterone. Their brains thus become organized in a feminine direction. When female rats are prenatally exposed to large doses of testosterone, their sexual organs become somewhat masculinized, and they are predisposed toward masculine mating behaviors in adulthood (Carlson, 2007).

In rats and other rodents, sexual differentiation of the brain is not complete at birth. Female rodents and monkeys who are given testosterone injections shortly before or shortly following birth (depending on the species) show typical masculine
sexual patterns in adulthood, mounting other females and resisting mounting by males (Phoenix, 2009).

Questions remain about the organizing effects of sex hormones on human sexual behavior. Prenatal sex hormones are known to play a role in the sexual differentiation of the genitalia and of the brain structures, such as the hypothalamus. Their role in patterning sexual behavior in adulthood remains unknown, however. Some researchers have speculated that the brains of transsexual individuals may have been prenatally sexually differentiated in one direction, while their genitals were being differentiated in the other (Money, 1994). It has been speculated that prenatal sexual differentiation of the brain may also be connected with sexual orientation.

What of the activating effects of sex hormones on human sex drive and behavior? Although the countless attempts to extract or synthesize aphrodisiacs have failed to produce the real thing, men and women normally produce a genuine aphrodisiac—testosterone. Testosterone activates the sex drives of both men and women (Guzick & Hoeger, 2000).

### Sex Hormones and Male Sexual Behavior

Male sex hormones are known to influence the sex drive and sexual response in non-human animals and men (Bialy & Sachs, 2002; Cooke et al., 2003). Evidence of the role for hormones in sex drive is found among men who have declines in testosterone levels as the result of chemical or surgical castration. Surgical castration (removal of the testes) is sometimes performed as a medical treatment for cancer of the prostate or other diseases of the male reproductive tract, such as genital tuberculosis. But some convicted sex offenders have voluntarily undergone castration as a condition of release.

Men who are surgically or chemically castrated usually exhibit a gradual decrease in the incidence of sexual fantasies and loss of sexual desire (Barbaree & Blanchard, 2008). They also gradually tend to lose the capacities to attain erection and to ejaculate—an indication that testosterone is important in maintaining sexual functioning as well as drive, at least in males. Castrated men show great variation in their sexual interest and functioning, however. Some continue to experience sexual desires and are able to function sexually for years, even decades. Learning appears to play a large role in determining continued sexual response following castration. Males who were sexually experienced before castration show a more gradual decline in sexual activity. Those who were sexually inexperienced at the time show relatively little or no interest in sex. Male sexual motivation and functioning thus involve an interplay of hormonal influences and experience.

Further evidence of the relationship between hormonal levels and male sexuality is found in studies of men with hypogonadism, a condition marked by abnormally low levels of testosterone production. Hypogonadal men generally suffer loss of sexual desire and a decline in sexual activity (McElduff & Beange, 2003). Here again, hormones do not tell the whole story. Hypogonadal men are capable of erection, at least for a while, even though their sex drives may wane. The role of testosterone as an activator of sex drives in men is further supported by evidence of the effects of testosterone replacement in hypogonadal men. When such men receive testosterone injections, their sex drives, fantasies, and activity are often restored to former levels (Seidman, 2003; Tan & Culberson, 2003).

Although minimal levels of androgens are critical to male sexuality, there is no one-to-one correspondence between hormone levels and the sex drive or sexual performance in adults. In men who have ample supplies of testosterone, sexual interest and functioning depend more on learning, fantasies, attitudes, memories, and other
psychosocial factors than on hormone levels. At puberty, however, hormonal variations may play a more direct role in stimulating sexual interest and activity in males. Udry (2001) found, for example, that testosterone levels predicted sexual interest, masturbation rates, and the likelihood of engaging in sexual intercourse among teenage boys. A positive relationship also has been found between testosterone levels in adult men and frequency of sexual intercourse (Dabbs & Morris, 1990). Moreover, drugs that reduce the levels of androgen in the blood system, called antiandrogens, lead to reductions in the sex drive and in sexual fantasies (Bradford, 1998).

Truth or Fiction Revisited: Men and women produce small amounts of the sex hormones of the other sex. Testosterone, the major form of androgen, or male sex hormone, is secreted in small amounts by the adrenal glands (located above the kidneys) in both sexes, but in much larger amounts by the testes. The ovaries produce small amounts of androgens but much larger amounts of the female sex hormones, estrogen and progesterone. The testes similarly produce small amounts of estrogen and progesterone.

Real Students, Real Questions

Q I don’t get an erection as quickly as I used to. What is wrong with me?
A Could be nothing. After the later teens, it’s all downhill, physiologically speaking, but it’s a very, very long slope—and a very gradual one. Also, in your middle teens you’ll have an erection in just a few seconds, so what does it matter if it takes a few more seconds, or a minute or two? Even when you’re in your 50s and older, when it can take a few minutes and manual or oral stimulation to become erect, it’s the quality of the overall experience that ought to matter and not the stopwatch. So many of our sexual problems are actually problems with our “oughts” and our “shoulds,” or with our partner’s “oughts” and “shoulds,” and not with our bodies. Keep in mind that sex is not a race.

Sex Hormones and Female Sexual Behavior

The female sex hormones estrogen and progesterone play prominent roles in promoting the changes that occur during puberty and in regulating the menstrual cycle. Female sex hormones do not appear to play a direct role in determining sexual motivation or response in human females, however.

In most mammals, females are sexually receptive only during estrus. Estrus is a brief period of fertility that corresponds to time of ovulation; during estrus, females are said to be “in heat.” Estrus occurs once a year in some species; in others, it occurs periodically during the year in mating seasons. Estrogen peaks at time of ovulation, so there is a close relationship between fertility and sexual receptivity in most female mammals. Human females’ sexuality is not clearly linked to hormonal fluctuations, however. Unlike females of most other species of mammals, the human female is sexually responsive during all phases of the reproductive (menstrual) cycle—even during menstruation, when ovarian hormone levels are low—and after menopause.

There is some evidence, however, that sexual responsiveness in women is influenced by the presence of circulating androgens, or male sex hormones, in their bod-
The adrenal glands of women produce small amounts of androgens, just as they do in males (Guzick & Hoeger, 2000). The fact that women normally produce smaller amounts of androgens than men does not mean that they necessarily have weaker sex drives. Rather, women appear to be more sensitive to smaller amounts of androgens. For women, it seems that less is more.

Women who have ovariectomies, which are sometimes carried out when a hysterectomy is performed, no longer produce female sex hormones. Nevertheless, they may continue to experience sex drives and interest as before. Loss of the ovarian hormone estradiol may cause vaginal dryness and make coitus painful, but it does not necessarily reduce sexual desire. (The dryness can be alleviated by a lubricating jelly or by estrogen-replacement therapy.) However, women whose adrenal glands and ovaries have been removed, so that they no longer produce androgens, gradually lose sexual desire (Nappi et al., 2006; Traish et al., 2006). An active and enjoyable sexual history seems to ward off this loss, however, suggestive of the impact of cognitive and experiential factors on human sexual response.

Research provides further evidence on the links between testosterone levels and women’s sex drives. In the earlier-mentioned studies by Udry and his colleagues, androgen levels were also found to predict sexual interest among teenage girls. In contrast to boys, however, girls’ androgen levels were unrelated to the likelihood of coital experience. Androgens apparently affect sexual desire in both sexes, but sexual interest may be more likely to be directly translated into sexual activity in men than in women (Peplau, 2003). This sex difference may be explained by society’s placement of greater restraints on female sexuality.

Other researchers report that women’s sexual activity increases at points in the menstrual cycle when levels of androgens in the bloodstream are high (Guay, 2001; Morley & Perry, 2003). Another study was conducted with women whose ovaries had been surgically removed (“surgical menopause”) as a way of treating disease. The ovaries supply major quantities of estrogen. Following surgery, the women in this study were treated either with estrogen-replacement therapy (ERT), with ERT plus androgens, or with a placebo (an inert substance made to resemble an active drug) (Sherwin et al., 1985). This was a double-blind study. Neither the women nor their physicians knew which drug the women were receiving. The results showed that the combination of androgens and ERT heightened sexual desire and sexual fantasies more than ERT alone or the placebo. The combination also helps women maintain a sense of psychological well-being (Guzick & Hoeger, 2000).

Androgens thus play a more prominent role than ovarian hormones in activating and maintaining women’s sex drives. As with men, however, women’s sexuality is too complex to be explained fully by hormone levels. For example, an active and enjoyable sexual history seems to ward off the loss of sexual interest that generally follows the surgical removal of the adrenal glands and ovaries.

### Sexual Response

Although we may be culturally attuned to focus on sex differences rather than similarities, Masters and Johnson (1966) found that the physiological responses of men and women to sexual stimulation (whether from coitus, masturbation, or other sources) are quite alike. The sequence of changes in the body that takes place as men and women become progressively more aroused is referred to as the sexual response cycle.
CHAPTER 5

Sexual Arousal and Response

Resolution

Orgasm

Plateau

Refractory period

Resolution

Male

Female

Figure 5.3  Levels of Sexual Arousal during the Phases of the Sexual Response Cycle. Masters and Johnson (1966) divide the sexual response cycle into four phases: excitement, plateau, orgasm, and resolution. During the resolution phase, the level of sexual arousal returns to the prearoused state. For men there is a refractory period after orgasm. As shown by the broken line, however, men can become rearoused to orgasm after the refractory period has passed and their level of sexual arousal returns to preplateau levels. Pattern A for women shows a typical response cycle, with the broken line suggesting multiple orgasms. Pattern B shows the cycle of a woman who reaches the plateau phase, but for whom arousal is "resolved" without reaching the orgasmic phase. Pattern C shows the possibility of orgasm in a highly aroused woman who passes quickly through the plateau phase.

The Four-Phase Masters and Johnson Sexual Response Cycle

Masters and Johnson divided the sexual response cycle into four phases: excitement, plateau, orgasm, and resolution. Figure 5.3 suggests the levels of sexual arousal associated with each phase. Both males and females experience vasocongestion and myotonia early in the response cycle. Vasocongestion is the swelling of the genital tissues with blood, which causes erection of the penis and engorgement of the area surrounding the vaginal opening. The testes, nipples, and even earlobes become engorged as blood vessels in these areas dilate.

Myotonia refers to muscle tension. Myotonia causes voluntary and involuntary muscle contractions, which produce facial grimaces, spasms in the hands and feet, and eventually, the spasms of orgasm. Let us follow these and the other bodily changes that constitute the sexual response cycle.

EXCITEMENT PHASE  In younger men, vasocongestion during the excitement phase produces penile erection as early as 3 to 8 seconds after stimulation begins. Erection may occur more slowly in older men, but the responses are essentially the same. Erection may subside and return as stimulation varies. The scrotal skin thickens, losing its baggy appearance. The testes increase in size. The testes and scrotum become elevated.

In the female, vaginal lubrication may start 10 to 30 seconds after stimulation begins. Vasocongestion swells the clitoris, flattens the labia majora and spreads them apart, and increases the size of the labia minora. The inner two-thirds of the vagina
expands. The vaginal walls thicken and, because of the inflow of blood, turn from their normal pink to a deeper hue. The uterus becomes engorged and elevated. The breasts enlarge, and blood vessels near the surface become more prominent.

The skin may take on a rosy sex flush late in this phase. It varies with intensity of arousal and is more pronounced in women. The nipples may become erect in both sexes, especially in response to direct stimulation. Men and women show some increase in myotonia, heart rate, and blood pressure.

**PLATEAU PHASE** A plateau is a level region, and the level of arousal remains somewhat constant during the plateau phase of sexual response. Nevertheless, the plateau phase is an advanced state of arousal that precedes orgasm. Men in this phase show a slight increase in the circumference of the coronal ridge of the penis. The penile glans turns a purplish hue, a sign of vasocongestion. The testes are elevated further into position for ejaculation and may reach one and one-half times their unaroused size. The Cowper’s glands secrete a few droplets of fluid that are found at the tip of the penis (see Figure 5.4 on page 150).

In women, vasocongestion swells the tissues of the outer third of the vagina, contracting the vaginal opening (thus preparing it to “grasp” the penis) and building the orgasmic platform (see Figure 5.5 on page 151). The inner part of the vagina expands fully. The uterus becomes fully elevated. The clitoris withdraws beneath the clitoral hood and shortens. Thus a woman (or her partner) may feel that the clitoris has become lost. This may be mistaken as a sign that the woman’s sexual arousal is waning, although it is actually increasing.

Coloration of the labia minora appears, which is referred to as the sex skin. The labia minora become a deep wine color in women who have borne children and bright red in women who have not. Further engorgement of the areolas of the breasts may make it seem that the nipples have lost part of their erection (see Figure 5.6 on page 152). The Bartholin’s glands secrete a fluid that resembles mucus.

About one man in four and about three women in four show a sex flush, which often does not appear until the plateau phase. Myotonia may cause spasmodic contractions in the hands and feet and facial grimaces. Breathing becomes rapid, like panting, and the heart rate may increase to 100 to 160 beats per minute. Blood pressure continues to rise. The increase in heart rate is usually less dramatic with masturbation than during coitus.

**Sex flush** A reddish rash that appears on the chest or breasts late in the excitement phase of the sexual response cycle.

**Plateau phase** The second phase of the sexual response cycle, which is characterized by increases in vasocongestion, muscle tension, heart rate, and blood pressure in preparation for orgasm.

**Sex skin** Reddening of the labia minora that occurs during the plateau phase.

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Real Students, Real Questions

**Q** Sometimes I don’t get lubricated, and intercourse is painful. Why don’t I get lubricated?

**A** There are many possibilities. Sometimes a woman needs more time or a more comfortable setting. If you suspect a health problem, check with your gynecologist. You can also try an artificial lubricant, like K-Y jelly. But by and large, simply ask yourself two questions: Do you know what turns you on? Are you making sure you get it? Maybe this means getting a new partner!
ORGASMIC PHASE

The orgasmic phase in the male consists of two stages of muscular contractions. In the first stage, contractions of the vas deferens, the seminal vesicles, the ejaculatory duct, and the prostate gland cause seminal fluid to collect in the urethral bulb at the base of the penis (see Figure 5.4). The bulb expands to accommodate the fluid. The internal sphincter of the urinary bladder contracts, preventing seminal fluid from entering the bladder in a backward, retrograde ejaculation. The normal closing off of the bladder also serves to prevent urine from mixing with semen. The collection of semen in the urethral bulb produces feelings of ejaculatory inevitability—the sensation that nothing will stop the ejaculate from “coming.” This sensation lasts for about 2 to 3 seconds.

In the second stage, the external sphincter of the bladder relaxes, allowing the passage of semen. Contractions of muscles surrounding the urethra and urethral bulb and the base of the penis propel the ejaculate through the urethra and out of the body. Sensations of pleasure tend to be related to the strength of the contractions and the amount of seminal fluid. The first 3 or 4 contractions are generally most intense and occur at 0.8-second intervals (5 contractions every 4 seconds). Another 2 to 4 contractions occur at a somewhat slower pace. Rates and patterns vary somewhat from man to man.

Orgasm in the female is manifested by 3 to 15 contractions of the pelvic muscles that surround the vaginal barrel. The contractions first occur at 0.8-second intervals, producing, as in the male, a release of sexual tension. Another 3 to 6 weaker and slower contractions follow. The spacing of these contractions is gener-
1. EXCITEMENT PHASE

- The clitoral glans and the labia swell resulting from vasocongestion
- Vagina begins to lubricate

2. PLATEAU PHASE

- Clitoris retracts under hood
- Bartholin's glands secrete fluid
- Labia minora increase in size and turn reddish purple
- Uterus elevates and increases in size
- Inner two-thirds of vagina expands and lengthens
- Outer third of vagina forms orgasmic platform

3. ORGASMIC PHASE

- Uterus contracts
- Orgasmic platform contracts
- Rectal sphincter contracts

4. RESOLUTION PHASE

- Clitoris descends to unaroused position
- The labia return to their unaroused state
- Uterus shrinks, returns to its normal position
- Cervix drops to its unaroused position
- Vagina returns to its unaroused position

**Figure 5.5** The Female Genitals during the Phases of the Sexual Response Cycle
1. EXCITEMENT PHASE

- Breast increases in size
- Nipple becomes erect
- Veins become more visible

2. PLATEAU AND ORGASMIC PHASES

- Vasocongestion of areola makes nipple seem less erect
- Rashlike sex flush may appear
- Reduction of areola causes increased prominence of nipple

3. RESOLUTION PHASE

- Breast increases still more in size
- Reduces of areola is reduced to normal in 5–10 minutes
- Breast size is reduced to normal

**Figure 5.6** The Breasts during the Phases of the Sexual Response Cycle

...more variable in women than in men. The uterus and the anal sphincter also contract rhythmically. Uterine contractions occur in waves from the top to the cervix. In both sexes, muscles go into spasm throughout the body. Blood pressure and heart rate reach a peak, with the heart beating up to 180 times per minute. Respiration may increase to 40 breaths per minute.

**Real Students, Real Questions**

**Q** Is there such thing as a female ejaculation? How does it occur? Where does the fluid come from?

**A** This is controversial. Some researchers find evidence of an ejaculation in some women. It could be urine or it might be released by a system called Skene’s glands. The only thing we’re certain of is that women usually have nothing to worry about if they expel a little liquid during orgasm.

**SUBJECTIVE EXPERIENCE OF ORGASM** The sensations of orgasm have challenged the descriptive powers of poets. Words like “rush,” “warmth,” “explosion,” and “release” do not adequately capture them. We may assume (rightly or wrongly) that others of our sex experience pretty much what we do, but can we understand the sensations of the other sex?

**Truth or Fiction Revisited:** Several studies suggest that written descriptions of women’s and men’s orgasms cannot be told apart. The orgasms of both may feel quite similar. In one study, 48 men and women provided written descriptions of orgasms. The researchers (Proctor et al., 1974) modified the language (for example, changing “penis” to “genitals”) so that the authors’ sexes would not be apparent. They then asked 70 “experts” (psychologists, gynecologists, etc.) to indicate the sex of each author. The ratings were no more reliable than guesswork—at least when they were altered to exclude language that gives away exactly which anatomic features are involved. (Thus, this Truth-or-Fiction item is only qualifiedly “true.” Listen: Life is complex. Be tolerant.)

**Resolution Phase** The fourth phase of the sexual response cycle, during which the body gradually returns to its prearoused state.

**Resolution Phase** The period following orgasm, in which the body returns to its prearoused state, is called the resolution phase. Following ejaculation, the man
loses his erection in two stages. The first occurs in about a minute. Half the volume of the erection is lost as blood from the corpora cavernosa empties into the other parts of the body. The second stage occurs over a period of several minutes: The remaining tumescence subsides as the corpus spongiosum empties. The testes and scrotum return to normal size, and the scrotum regains its wrinkled appearance.

In women, orgasm also triggers release of blood from engorged areas. In the absence of continued stimulation, swelling of the areolas decreases; then the nipples return to normal size. The sex flush lightens rapidly. In about 5 to 10 seconds the clitoris descends to its normal position. The clitoris, vaginal barrel, uterus, and labia gradually shrink to their preroused sizes. The labia minora turn lighter (the “sex skin” disappears) in about 10 to 15 seconds.

Most muscle tension (myotonia) tends to dissipate within 5 minutes after orgasm in both men and women. Blood pressure, heart rate, and respiration may also return to their prerousal levels within a few minutes. About 30 to 40% of men and women find their palms, the soles of their feet, or their entire bodies covered with a sheen of perspiration. Both men and women may feel relaxed and satiated. However, . . .

Although the processes by which the body returns to its prerousal state are similar in men and women, there is an important sex difference during the resolution phase. Unlike women, men enter a refractory period during which they are physiologically incapable of experiencing another orgasm or ejaculation. The refractory period of adolescent males may last only minutes, whereas that of men age 50 and above may last from several minutes (yes, it could happen) to a day. Women do not undergo a refractory period and so can become quickly rearoused to the point of repeated (multiple) orgasms if they desire and receive continued sexual stimulation (see Figure 5.3).

Myotonia and vasocongestion may take an hour or more to dissipate in people who are aroused but who do not reach orgasm. Persistent pelvic vasocongestion may cause “blue balls” in males—the slang term for a throbbing ache. Some men insist that their dates should consent to coitus because it is unfair to stimulate them to the point where they have this condition. This condition can be relieved through masturbation as well as coitus, however—or allowed to dissipate naturally. Although it may be uncomfortable, it is not dangerous and should not be an excuse to pressure or coerce another person into any sexual activity. “Blue” sensations are not limited to men. Women, too, may experience unpleasant pelvic throbbing if they have become highly aroused and do not find release. Women, too, can relieve the throbbing through masturbation.

Truth or Fiction Revisited: Masters and Johnson (1966) did find that orgasms experienced during masturbation were generally more physiologically intense than those experienced during intercourse. Perhaps masturbation allows one to focus only on one’s own pleasure and ensure that one receives effective stimulation to climax. This does not mean that orgasms during masturbation are more enjoyable or gratifying than those experienced through coitus. Given the sexual attraction and emotional connectedness we may feel toward our lovers, we are unlikely to break off relationships in favor of masturbation. “Physiological intensity” does not directly translate into subjective pleasure or fulfillment.

Kaplan’s Three Stages of Sexual Response:
An Alternative Model

Perhaps the only alternative view of the sexual response cycle that has received continued attention is the one proposed by Helen Singer Kaplan. Kaplan was a prominent sex therapist and author of several professional books (1974, 1987) on sex
therapy. Whereas Masters and Johnson had proposed a four-stage model of sexual response, Kaplan developed a three-stage model consisting of (1) desire, (2) excitement, and (3) orgasm. Kaplan’s model is an outgrowth of her clinical experience in working with people with sexual dysfunctions. She believes that their problems can best be classified according to these three phases. Kaplan’s model makes it convenient for clinicians to classify sexual dysfunctions involving desire (low or absent desire), excitement (such as problems with erection in the male or lubrication in the female), and orgasm (such as premature ejaculation in the male or orgasmic dysfunction in the female).

Masters and Johnson view sexual response as composed of successive stages; the order is crucial and invariant. Kaplan treats her phases as relatively independent components of sexual response whose sequence is somewhat variable. For example, a person may experience sexual excitement and even orgasm, even though sexual desire remains low.

Kaplan’s model is noteworthy for designating desire as a separate phase of sexual response. Problems in lack of sexual interest or desire are among the most common brought to the attention of sex therapists.

**Controversies about Orgasm**

Few other topics in human sexuality have aroused more controversies over the years than orgasm. We do not have all the answers, but some intriguing research findings have shed light on some continuing controversies. Are women capable of experiencing multiple orgasms? Are men?

**MULTIPLE ORGASMS** Kinsey and colleagues (1953) reported that 14% of his female respondents regularly had multiple orgasms, surprising fellow scientists as well as the community at large. Many people were aghast that women could have more than one orgasm at a time. There were comments (mostly by men, of course!) that the women in the Kinsey surveys must be “nymphomaniacs” who were incapable of being satisfied with the “normal” complement of one orgasm per occasion. However, only 13 years later, Masters and Johnson (1966) reported that most if not all women are capable of multiple orgasms. Although all women may have a biological capability for multiple orgasms, not all women report them. A survey of 720 nurses showed that 43% reported experiencing multiple orgasms (Darling et al., 1991). Nearly half of them experienced multiple orgasms when they used a vibrator. They generally applied the vibrator to the clitoris and reported that orgasms experienced with the vibrator were more intense than other kinds. Two-thirds of the women, by the way, used the vibrators in conjunction with sexual activity with their husbands.

By Masters and Johnson’s definition, men are not capable of achieving multiple orgasms because they enter a refractory period following ejaculation. Men who want more than one orgasm during one session may have to pause for a while. Women, however, can maintain a high level of arousal between multiple orgasms and have them in rapid succession because women do not have a refractory period. Women can continue to have orgasms if they continue to receive effective stimulation (and, of course, are interested in continuing). Some men thus refrain from reaching orgasm until their partners have had the desired number. The differential capacity for multiple orgasms is one of the major sex differences in sexual response.

Some men have two or more orgasms without ejaculation (“dry orgasms”) preceding a final ejaculatory orgasm. These men may not enter a refractory period fol-
lowing their initial dry orgasms and may therefore be able to maintain their level of stimulation at near-peak levels.

Masters and Johnson (1966) found that some women experienced 20 or more orgasms by masturbating. Still, few women have multiple orgasms during most sexual encounters, and many are satisfied with just one per occasion. Some women who have read or heard about female orgasmic capacity wonder what is “wrong” with them if they are content with just one. Nothing is wrong with them, of course: A biological capacity does not create a behavioral requirement.

How Many Kinds of Orgasms Do Women Have? One, Two, or Three?

Until Masters and Johnson published their laboratory findings, many people believed that there were two types of female orgasm, as proposed by the psychoanalyst Sigmund Freud: the clitoral orgasm and the vaginal orgasm. Clitoral orgasms were achieved through direct clitoral stimulation, such as by masturbation. Clitoral orgasms were seen by psychoanalysts (mostly male psychoanalysts, naturally) as emblematic of a childhood fixation—a throwback to an erogenous pattern acquired during childhood masturbation.

The term vaginal orgasm referred to an orgasm achieved through coitus and was theorized to be a sign of mature sexuality. Freud argued that women achieve sexual maturity when they forsake clitoral stimulation for vaginal stimulation. This view would be little more than an academic footnote but for the fact that some adult women who continue to require direct clitoral stimulation to reach orgasm, even during coitus, have been led by traditional (generally male) psychoanalysts to believe that they are sexually “fixated” at an immature stage or are sexually inadequate.

Despite Freudian theory, Masters and Johnson (1966) were able to find only one kind of orgasm, physiologically speaking, regardless of the source of stimulation (manual–clitoral or penile–vaginal). By monitoring physiological responses to sexual stimulation, they found that the female orgasm involves the same biological events whether it is reached through masturbation, petting, coitus, or even stimulation of the breasts. In men, also, it does not matter how orgasm is achieved—through masturbation, petting, oral sex, coitus, or by fantasizing about a fellow student in chem lab. Orgasm still involves the same physiological processes: Involuntary contractions of the pelvic muscles at the base of the penis expel semen and release sexual tension. A woman or a man might prefer one source of orgasm to another—with a lover rather than by masturbation, or with one person rather than another, but the biological events that define orgasm remain the same.

The purported distinction between clitoral and vaginal orgasms also rests on an assumption that the clitoris is not stimulated during coitus. Masters and Johnson showed this assumption to be false. Penile coital thrusting draws the clitoral hood back and forth against the clitoris. Vaginal pressure also heightens blood flow in the clitoris, helping set the stage for orgasm (Cai et al., 2008).

One might think that Masters and Johnson’s research settled the question of whether or not there are different types of female orgasm. Other investigators, however, have proposed that there are distinct forms of female orgasm, yet not those suggested by psychoanalytic theory. For example, Singer and Singer (1972) suggested that there are three types of female orgasm: vulval, uterine, and blended. According to the Singers, the vulval orgasm represents the type of orgasm described by Masters and Johnson (1966). It involves vulval contractions—that is, contractions of the
At 7:00 each morning, perhaps a dozen women lie nude below the waist, eyes closed, in a darkened room in a commune in San Francisco’s South of Market district. This is “morning practice.” Clothed men, called research partners, stroke them in a session of “orgasmic meditation,” or “OMing.” There is no eye contact between the partners. The commune has adapted concepts of feminism and Eastern philosophy to focus on women’s sexual pleasure.

Thirty-eight men and women, whose average age is the late 20s, live in the retreat center founded by Nicole Daedone. They share meals, yoga, and nonsexual forms of meditation, as well as focus on the female orgasm. Daedone is a leader of the so-called “slow-sex movement”—in opposition to the male tradition of slam-bam—thank-you ma’am. The point to the commune is women’s pleasure—not romantic relationships. Some research partners may be romantically involved, but romance is irrelevant. “It’s a procedure . . . with no other strings attached,” noted Daedone’s boyfriend. “When you go to a massage therapist,” he added, “you don’t take the masseuse to dinner afterward” (Brown & Pogash, 2009).

“The notion of a San Francisco sex commune focused on female orgasm is part of a long and rich history of women being public and empowered about their sexuality,” says Elizabeth A. Armstrong (2009) of Indiana University, home of the world-famous Kinsey Institute. Although it is nearly five years old, One Taste hasn’t drawn much attention. Could that be because it is exactly the type of thing San Franciscans expect to find in their backyard?

Residents are an eclectic group. Most are young, and many are from conservative backgrounds. Beth, age 33, was raised in backwoods Virginia, where nobody talked about female anatomy. Masturbation was out of the question: “I’d never done anything even in the dead of night” (Brown & Pogash, 2009). Then there is the recently divorced 50-year-old Silicon Valley engineer, who says that focusing on a small area of female anatomy helps him concentrate on the job. Another female resident, Racheli, age 28, had fought alcoholism and anorexia. She says that One Taste has provided “deep physical access to the woman I am and the woman I want to be” (Brown & Pogash, 2009).

“In our culture,” says Daedone, “women have been conditioned to have closed sexuality and open feelings, and men to have open sexuality and closed feelings. There’s this whole area of resistance and shame” (Brown & Pogash, 2009).

Consistent with the findings of Masters and Johnson (1966), they accept that a vulval orgasm remains the same regardless of the source of stimulation, clitoral or vaginal.

According to the Singers, the uterine orgasm does not involve vulval contractions. It occurs only in response to deep penile thrusting against the cervix. This thrusting slightly displaces the uterus and stimulates the tissues that cover the abdominal organs. The uterine orgasm is accompanied by a certain pattern of breathing; gasping or gulping of air is followed by an involuntary holding of the breath as
orgasm approaches. When orgasm is reached, the breath is explosively exhaled. The uterine orgasm is accompanied by deep feelings of relaxation and sexual satisfaction.

The third type—blended orgasm—combines features of vulval and uterine orgasms. It involves both an involuntary breath-holding response and contractions of the pelvic muscles. The Singers note that the type of orgasm a woman experiences—vulval, uterine, or blended—depends on factors such as the parts of the body that are stimulated and the duration of stimulation. Each produces its own kind of satisfaction, and no type is necessarily better or preferable to another. The Singers’ hypothesis of three distinct forms of female orgasm remains controversial.
The 3 R’s: Reflect, Recite, and Review

Your text uses the PQ4R method. Congratulations on completing the first R—reading the chapter. The remaining 3 R’s—reflect, recite, and review—will help you understand and recall the material in the chapter, as well as test your mastery.

Reflect

- Do you find nude people to be sexually arousing? Why or why not?
- Have you done anything under the influence of alcohol or other drugs that you otherwise would not have done? What role did the drug play? Are you sure?
- Do you know people who have taken testosterone or estrogen for medical or other reasons? What were the reasons for using hormones? What were their effects?
- Does the research finding that women but not men experience multiple orgasms challenge any prevailing views about female sexuality?
- CRITICAL THINKING: To what extent is response to sexual stimulation mechanical, and to what extent does it involve the “human” qualities of thought and judgment? Have your views on why and how you become sexually aroused changed as a result of reading this chapter? Explain.

Recite

1. What are the roles of the senses in sexual arousal?
   - Visual cues, particular odors, and sounds can be sexual turn-ons or turn-offs. The sense of touch has the most direct effects on sexual arousal and response. Taste appears to play only a minor role. Many organisms are sexually aroused by pheromones, but their role in human sexual behavior remains unclear. Underarm secretions may make men and women more sexually attractive and male underarm secretions have a positive effect on the moods of women. Exposure to the odor of other women’s sweat appears to synchronize the menstrual cycles of women who live together. Gay males may be drawn to the body odors of other gay males. Heterosexual males prefer the body odors of females and of heterosexual males to those of gay males. Primary erogenous zones are richly endowed with nerve endings. Secondary erogenous zones become erotically sensitized through experience.

2. What is an aphrodisiac?
   - An aphrodisiac is a substance that is sexually arousing. Alleged aphrodisiacs such as Spanish fly and foods that resemble the genitals have not been shown to contribute to sexual arousal. The male sex hormone testosterone heightens the sex drive in both males and females. Anaphrodisiacs include amyl nitrate and antiandrogens.
   - The alleged aphrodisiac effects of psychoactive drugs, such as alcohol and cocaine, may reflect our expectations or their effects on sexual inhibitions, rather than direct stimulation of sexual response. Some people report initial increased sexual pleasure with cocaine use, but frequent use can lead to sexual dysfunctions. Wellbutrin and L-dopa may have aphrodisiacal properties.

3. What is the role of the brain in sexual response?
   - The cerebral cortex interprets sensory information as sexual turn-ons or turn-offs. It transmits messages through the spinal cord that cause vasocongestion. Stimulation of parts of the limbic system causes sexual arousal and sensations similar to those of orgasm.

4. How do hormones affect the sex drive and sexual response?
   - Sex hormones have organizing and activating effects. Men and women normally produce one genuine aphrodisiac: testosterone.

5. How does the body respond to sexual stimulation?
   - Masters and Johnson found that the physiological responses of men and women to sexual stimulation are similar, including vasocongestion and myotonia. Sexual excitement is characterized by erection in the male and vaginal lubrication in the female. The plateau phase is an advanced state of arousal that precedes orgasm. The third phase of the sexual response cycle is characterized by orgasmic contractions of the pelvic musculature. During
the resolution phase, the body returns to its prearoused state.

- Kaplan developed a three-stage model of sexual response consisting of desire, excitement, and orgasm. Multiple orgasm is the occurrence of one or more additional orgasms following the first, within a short period of time and before the body has returned to a preplateau level of arousal. Freud theorized two types of female orgasm: clitoral and vaginal. Masters and Johnson found only one kind of orgasm among women. Singer and Singer suggested that there are three types of female orgasm: vulval, uterine, and blended.

Review

1. The effects of Spanish fly are due to __________ in the urinary tract.
   (a) a burning sensation
   (b) moisture
   (c) a burst of cerebral neurons
   (d) ethanol

2. Alcohol is known to have
   (a) depressing effects only.
   (b) stimulating effects only.
   (c) both stimulating and depressing effects.
   (d) neither stimulating nor depressing effects.

3. Cells in the __________ cortex transmit messages when we experience sexual thoughts and fantasies.
   (a) reticular
   (b) avuncular
   (c) sexual
   (d) cerebral

4. When the rear part of a male rat’s __________ is stimulated by electricity, the animal runs through its sexual routine mechanically.
   (a) thalamus
   (b) hypothalamus
   (c) occipital lobe
   (d) larynx

5. According to Masters and Johnson, sexual arousal is characterized by vasocongestion and
   (a) myotonia.
   (b) blurry vision.
   (c) cramping.
   (d) constriction of blood vessels.

6. According to Masters and Johnson, erection and lubrication occur during the ________ phase of the sexual response cycle.
   (a) orgasmic
   (b) excitement
   (c) plateau
   (d) resolution

7. Men enter a refractory period following the ________ phase of the sexual response cycle.
   (a) excitement
   (b) plateau
   (c) resolution
   (d) orgasmic

8. The hormone ________ activates the sex drives of both men and women.
   (a) prolactin
   (b) oxytocin
   (c) progesterone
   (d) testosterone

9. Foods such as oysters and bananas have been considered aphrodisiacs because they
   (a) are chemically similar to compounds secreted by the male genitals.
   (b) are enjoyed by women.
   (c) are popular among the upper classes.
   (d) resemble the male genitals.

10. In many animals, the vomeronasal organ detects
    (a) pheromones.
    (b) contractions of the orgasmic platform.
    (c) pituitary secretions.
    (d) cerebral activity.