Overview

This chapter summarizes the history, pharmacology, epidemiology, and the physical/psychological effects of psychedelic drugs. The botany, compulsive qualities, and legal complications of marijuana use along with an examination of the medical marijuana controversy is also explored.

Psychedelics have been used for thousands of years for religious, social, ceremonial, and medical purposes. They originally came from some of the 4,000 plants that have psychoactive effects.

In more modern times, many psychedelics have been synthesized. LSD, MDMA, and hundreds of psycho-stimulants are created every day by street chemists.

Psychedelics or “All Arounders” are generally classified into five major categories:

- **indoles**: e.g., LSD, psilocybin mushrooms, ibogaine, DMT;
- **phenylalkylamines**: e.g., mescaline (peyote), MDMA (ecstasy), MDA;
- **anticholinergics**: e.g., belladonna, henbane, mandrake & datura;
- **miscellaneous psychedelics**: e.g., PCP, DXM, *Salvia divinorum*; and
- **cannabinoids**: marijuana.

All psychedelics cause intensified and confused sensations as well as illusions, delusions, and hallucinations. Many of the psychedelics also cause stimulation, impaired judgment, and faulty reasoning.

Marijuana is the most widely used psychedelic; 160 million people worldwide use *Cannabis*. The use of phenylalkylamines, also known as psycho-stimulants, particularly MDMA (ecstasy) has decreased slightly in recent years. Club drugs such as ecstasy, mephedrone and MDPV are used to enhance the music party/club/rave experience. Other so-called club drugs popular in the music scene include ketamine, GHB, and nitrous oxide. The other psychedelics are used at a fraction of the rate that marijuana is used. LSD use has gone down substantially since its heyday in the 1960s and ‘70s.

Synthetic analogs of marijuana’s most psychoactive chemical, THC were sold legally as “herbal incense” with trade names like K₂® or Spice® until 2011 when five of these chemicals were classified as Schedule I drugs of abuse. Most states have banned the sale of these incense products. Powerful synthetic stimulants sold as “bath salts” with trade names like Ivory Wave® or Cloud 9® were still legal under federal law in 2011 but several states have classified them as Schedule I illegal drugs.
Chapter 6 – ALL AROUNDERS

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Extended Outline

I. INTRODUCTION & HISTORY (PP. 6.2–6.3)
Psychedelics dramatically alter a user's sensory perceptions and create a world in which reason takes a back seat to intensified sensations by creating illusions, delusions, and hallucinations.

More than 4,000 plants have psychedelic (hallucinogenic) or psychoactive properties but only a few dozen are used. Some of these plants have been around for 250 million years.

The initial objective of use was to alter one’s consciousness and perception of reality rather than to induce an immediate rush.

Most psychedelics are grown and used in the Americas, Europe, and Africa; the major exception is marijuana which is grown and used throughout the world. People have used peyote, psilocybin mushrooms, yage, marijuana, and morning glory seeds for religious, social, ceremonial, and medical purposes.

Other than marijuana, psychedelics are more popular among young White users, followed by Hispanics. Per-capita use among African Americans is the lowest.

II. CLASSIFICATION (P. 6.3)
There are five main chemical classifications of psychedelics:

- **indoles** (e.g., LSD, psilocybin mushrooms);
- **phenylalkylamines** (e.g., peyote, MDMA)
- **anticholinergics** (e.g., belladonna, datura);
- **others** (e.g., ketamine, PCP, *Salvia divinorum*, dextromethorphan [DXM]);
- **cannabinoids** found in marijuana (*Cannabis*) plants.

III. GENERAL EFFECTS (PP. 6.3–6.12)

A. ASSESSING THE EFFECTS (pp. 6.3–6.5)
Much of the information about the effects of psychedelics is anecdotal rather than the result of extended scientific testing. Most plant-based psychedelics contain more than one active ingredient.

The duration and intensity of the effects depend on

- the toxicity of the psychedelic
- the dose
- the users experience with the drug,
- the basic emotional makeup of the user,
- the users mood/mental state at the time of use,
- the existence of any mental illnesses
- the surroundings in which the drug is taken.
1. Physical & Mental Effects
LSD, ecstasy, and most other hallucinogens stimulate the sympathetic nervous system, raising pulse rate and blood pressure and causing sweating and nausea. Psychedelics' effects on serotonin alter sensory perception.

The stimulation of the brainstem overloads the sensory pathways, making the user acutely aware of all sensation. Disruption of visual and auditory centers can confuse perception. An auditory stimulation such as music might jump to a visual pathway, causing the music to be “seen.” This crossover or mixing of the senses is known as synesthesia.

2. Illusions, Delusions & Hallucinations
An illusion is a mistaken perception of an external stimulus.
A delusion is a mistaken idea or belief that is not swayed by reason or other contradictory evidence.
A hallucination is a sensory experience that doesn’t come from external stimuli.

IV. LSD, PSilocybin Mushrooms & Other Indole Psychedelics (pp. 6.5–6.12)
Indole psychedelics are also known as serotonin-like psychedelics because they seem to exert many of their effects through interactions with serotonin receptors, particularly those designated 5HT2A. In addition to affecting mood, sleep, and anxiety, serotonin influences areas of the brain that are most likely to generate hallucinations and illusions.

A. LYSERGIC ACID DIETHYLAMIDE (LSD) (pp. 6.5–6.9)
1. History
LSD (lysergic acid diethylamide) is a semisynthetic form of an ergot fungus toxin that infects rye and other cereal grasses. The brownish purple fungus was responsible for many outbreaks of ergot poisoning and thousands of deaths over the centuries due to farmers and town folk accidentally ingesting the infected grain.

Gangrenous ergotism, also known as “Saint Anthony’s Fire,” is marked by feverish hallucinations and gangrenous extremities rotting away.
Convulsive ergotism is marked by visual and auditory hallucinations, painful muscular contractions, delirium, convulsions, etc.
Dr. Albert Hoffman first extracted LSD in 1938. He discovered the hallucinogenic properties of the new drug after accidentally ingesting a dose.
LSD was studied as a potential therapy for mental illnesses and alcoholism, and as a key to investigating thought processes. In the early 1950s the CIA conducted a number of experiments using LSD as a potential truth drug or mind-control drug in a program code-named MK-ULTRA.
Harvard psychologists Drs. Timothy Leary and Richard Alpert popularized LSD-25. Dr. Leary’s slogan “Turn on, tune in, and drop out,” was used endlessly in newspaper articles and TV news shows and served as the rallying cry for the youth of the 1960s and 1970s.

LSD was made illegal on February 1, 1966. All scientific research on the drug ceased in the early seventies, recently research on LSD and MDMA has been renewed.

2. Manufacture of LSD
The majority of LSD was manufactured in the San Francisco Bay Area. Eleven pounds of LSD is the nation's annual consumption. The end product of the initial synthesis, crystalline LSD, is dissolved in alcohol. The solution is dropped on blotter paper and chewed or swallowed.

3. Epidemiology
Young Americans used LSD in the early 1990s, but use dropped by the early 2000s due to the popularity of ecstasy and federal efforts to restrict the manufacture of LSD (by 95%). Price also became an issue, a single hit went from $5 to $20 or more.

In the 1990s and 2000s, young teens said they tried LSD to get high or to augment the effects of ecstasy, GHB, or ketamine at raves, clubs and parties. Standard drug tests usually do not screen for LSD which contributed to the brief resurgence in use.

4. Pharmacology
LSD (C20H25N3O) is remarkable for its potency. Doses as low as 25 µg, or 25 millionths of a gram, can cause stimulatory as well as mental effects. Effects appear 15 to 60 minutes after ingestion, peak at 2 to 4 hours, and last 6 to 8 hours. The user returns to the pre-drug state 10 to 12 hours after ingestion. The usual psychedelic dose of LSD is 150 to 300 µg.

Tolerance develops very rapidly to the psychedelic effects of LSD. Withdrawal usually mental and emotional rather than physical.

5. Physical Effects & Mental Effects
LSD can cause a rise in heart rate and blood pressure, a higher body temperature, dizziness, dilated pupils, and some sweating.

6. Mental Effects
LSD overloads the brainstem, the sensory switchboard for the mind, causing sensory distortions (seeing sounds, feeling smells, or hearing colors [synesthesia]), dreaminess, depersonalization, altered mood, impaired concentration, and weakened motivation.

One of the greatest dangers of use is impaired reasoning and loss of judgment. This loss, coupled with slowed reaction time and visual distortions, can make driving a car a recipe for disaster.

7. Bad Trips (acute anxiety reactions)
Because LSD affects the emotional center in the brain and distorts reality, some novice users are subject to the extremes of euphoria and panic. Depersonalization and lack of a stable environment can trigger acute anxiety, paranoia, fear of loss of control, and delusions of persecution.

8. Mental Illness & LSD

Proponents of psychotherapeutic use claim that drug-stimulated insights provide some patients with a shortcut through psychotherapy, a process in which uncovering traumas and conflicts from the subconscious helps the patient heal.

Users with a preexisting mental illness or instability can aggravate those conditions, creating more-severe mental disturbances.

Some otherwise normal users can experience a temporary, but prolonged, psychotic reaction or severe depression that requires extended treatment.

Flashbacks & Hallucinogen Persisting Perception Disorder (HPPD). A number of users experience mental flashbacks of sensations, or of a bad trip they had while under the influence of LSD. Most flashbacks are provoked by some sensory stimulus: sight, sound, odor, or touch. The other type of HPPD is the intermittent or continuous experience of LSD-like visual and perceptual disturbances that chronically occur. This type of HPPD may disappear within five years or may persist indefinitely.

A number of psychedelics have the capacity to cause HPPD (e.g., LSD, MDMA, MDA, mescaline, DMT, PCP, marijuana, and psilocybin). Flashbacks are experienced by 23% to 64% of regular LSD users. A number of medications have been tried on HPPD but with limited success.

9. Dependence

The 500 or more LSD trips reported by some users are probably due to a psychological dependence rather than a physical dependence even though tolerance does develop rapidly.

B. “MAGIC MUSHROOMS” (Psilocybin & Psilocin) (pp. 6.9–6.10)

Psilocybin and psilocin are the active ingredients in a number of psychedelic mushrooms found in the Americas, Southeast Asia, and Europe. These mushrooms were especially important to Indian cultures in Mexico and in the pre-Columbian Americas; they were used in ceremonies dating as far back as 1000 B.C. and are still used today. Persecution by the Spanish Conquistadores in the sixteenth and seventeenth centuries drove the ceremonial use of mushrooms underground for hundreds of years.

Shamans use the mushrooms to induce visions that would help them treat illnesses, resolve problems, or communicate with the spirit world.
1. Pharmacology
Psilocybin and psilocin are found in about 100 different species of mushroom. The chemical structure of psilocybin is similar to that of LSD. Both wild and cultivated mushrooms vary greatly in strength, so a single potent mushroom might have as much psilocybin as 10 weak ones. Psychic effects are obtained from doses of 10 to 60 milligrams (mg) and generally last three to six hours.

2. Effects
Most mushrooms containing psilocybin cause nausea and other physical symptoms before the psychedelic effects take over. The effects include visceral sensations, changes in sight, hearing, taste, and touch, and altered states of consciousness. Psilocybin does not create as much disassociation or panic as does LSD. One of the major dangers of “shroom” harvesting is mistaking poisonous mushrooms for those containing psilocybin.

C. OTHER INDOLE PSYCHEDELICS (pp. 6.10–6.12)
1. Ibogaine
Produced by the African Tabernanthe iboga shrub and other plants, ibogaine in low doses acts as a stimulant; in higher doses it produces long-acting psychedelic effects and a self-determined catatonic reaction that can be maintained for up to two days. There is research on the use of ibogaine to treat heroin, alcohol, and cocaine addiction.

2. Morning Glory Seeds (ololiuqui)
Seeds from the morning glory plant or Hawaiian baby woodrose contain several LSD-like substances, particularly lysergic acid amide, which is about one-tenth as potent as LSD. It takes several hundred seeds to get high, that quantity magnifies the drug’s nauseating properties. Commercially sold morning glory seeds are dipped in a toxin that induces vomiting.

3. DMT (dimethyltryptamine)
DMT is found naturally in South American trees, vines, shrubs, and mushrooms (e.g., yopo beans) and is synthesized by street chemists. DMT is a psychedelic substance similar in structure to psilocin. It can also be snorted or injected. South American tribes have used it for more than 400 years. It is prepared from several different plants as a snuff called “yopo,” “cohoba,” etc. DMT causes intoxication, intense visual rather than auditory hallucinations, and often a loss of awareness of surroundings lasting 30 to 60 minutes or less. The short duration of action gave rise to its nickname, “businessman’s special.”
4. Foxy (5-methoxy-N, N-diisopropyltryptamine [5-Me-DIPT]) & AMT (alphamethyltryptamine)
These two psychedelic tryptamines appeared in the early 2000s, today they are listed as scheduled drugs. Effects include hallucinations, euphoria, empathy, visual and auditory disturbances (illusions), formication, paranoia, and emotional distress. The effects can last 12 to 24 hours, smaller doses last only 3 to 6 hours.

5. Ayahuasca (yage)
Ayahuasca, also known as yage, is a psychedelic drink made from the leaves, bark, and vines of Amazon jungle vines. Drinking this preparation causes intense vomiting, diarrhea, and then a dreamlike condition that lasts up to 10 hours.

The active ingredient is the indole alkaloid harmaline. Native cultures often mix yage with DMT plant extracts to intensify the effects.

Over the past few years, cults using ayahuasca as the focus of their beliefs have sprung up in Brazil.

V. PEYOTE, MDMA & OTHER PHENYLALKYLAMINE PSYCHEDELICS (PP. 6.12–6.17)
This class of psychedelics is chemically related to adrenaline and amphetamine, although many of the effects are quite different. Phenylalkylamines take several hours to reach their peak.

A. PEYOTE (MESCALINE) (pp. 6.12-6.14)
Mescaline is the active component of the peyote cactus (Lophophora williamsii) and the San Pedro cactus (Trichocereus pachanoi). The use of the peyote cacti goes back to at least 3700 B.C. Over the centuries the Aztecs, Toltecs, Chichimecas, and several Meso-American cultures included it in their rituals.

There have been many challenges to the legality of using a psychedelic substance for a religious ceremony. In 1996 the U.S. Supreme Court ruled that the use of peyote during religious ceremonies by Native Americans is protected by the Constitution, and individual states cannot ban its use. The Native American Church of North America has a claimed membership of 250,000 and uses peyote. Peyote cacti are eaten in spiritual ceremonies by the tribes in northern Mexico.

1. Effects
The gray-green crowns of the peyote cactus are cut at ground level or uprooted and are used fresh or dried. The effects of mescaline last approximately 12 hours and are very similar to LSD with an emphasis on colorful visions and hallucinations. A peyote ceremony might consist of ingesting 8-12 peyote buttons, then singing, drumming, and chanting to seek a spiritual experience through psychedelic visions.
Use of a mind-altering substance in a structured ceremonial setting can induce a higher level of spirituality than use at a rock concert. Peyote’s connection to spiritual matters limits abuse.

B. PSYCHO-STIMULANTS (MDA, MDMA, 2C-B, PMA, 2C-T-7, 2C-T-2, ET AL.) & CLUB DRUGS (pp. 6.14–6.17)

Psycho-stimulants are chemically defined as phenylethylamine derivatives similar to mescaline.

1. MDMA (ecstasy)

The psycho-stimulant MDMA, chemical name 3, 4-methylenedioxymethamphetamine, is shorter acting than MDA (4 to 6 hours vs. 10 to 12). It can be swallowed, snorted, or injected, much like methamphetamine, though it is usually sold as a capsule, tablet, or powder. MDMA is taken at parties, raves, and music clubs because users claim it creates a strong desire to move about, dance, and interact with other people.

**History.** The German pharmaceutical company, Merck, first discovered MDMA in 1914 as an intermediate chemical step in its synthesis of MDA. The first published human study of MDMA in 1969 described the personal insight the drug produced and recommended its use to a number of therapists to help their patients tap into their emotions and repressed memories. Some therapists continued to experiment with MDMA as a treatment for psychological disorders. After a series of hearings, starting in 1985, MDMA was banned in 1988 in the United States as a Schedule I drug, making it impossible to legally continue psychotherapeutic experimentation.

Prior to its ban, up to 50,000 tablets a week were legally sold. Trafficking in this psycho-stimulant continues but not at the rate of a few years ago.

**Use & Cost.** Ecstasy is often stuffed into a Tootsie Roll, users call it “rolling”. Vicks® inhalants and other pungent substances that are said to be pleasingly enhanced by the use of “E” are also found at rave clubs. A capsule, a tablet, or an equivalent powder packet (75 to 125 mg) costs about $25, sometimes as high as $70.

A DEA report found that 30% to 50% of the tablets sold as MDMA at raves contain no MDMA but rather other illicit drugs such as PCP and/or methamphetamine.

**Physical Effects.** MDMA has stimulant effects similar to amphetamines. The onset usually consists of tightening muscles with generalized spasms, trismus (jaw muscle spasm), and bruxism (clenching of the teeth) prior to the psychic effects. For occasional users of low or moderate amounts, most of the physical effects are relatively benign.

More serious MDMA effects include dehydration, blurred vision, headaches, agitation, nausea, anorexia, dangerous heart arrhythmias and, in a few cases, seizure activity, stroke, cardiovascular failure, coma, and malignant hyperthermia (high body temperature).
**Mental/Emotional Effects.** Twenty minutes to an hour after ingestion and continuing for 3 to 4 more hours, MDMA induces feelings of happiness, clarity, peace, pleasure, and altered sensory perceptions. Users also report experiencing increased nonsexual empathy for others, more self-awareness, and heightened self-esteem, open mindedness, acceptance, and intimacy in their interactions. For the first few hours of use, ecstasy continues to overwhelm the vesicles and forces them to discharge their reservoirs of serotonin. It can take up to a week or more to produce a sufficient amount of serotonin to re-experience similar feelings.

Due to this excessive stimulation, serotonin receptors retreat into the cell membrane to avoid damage. This process, called “down regulation,”

Following an ecstasy experience, some users have been known to become extremely depressed and suicidal.

**MDMA Polydrug Combinations.** Ecstasy is often ingested simultaneously with a number of prescription and street drugs.

- LSD with ecstasy is said to prolong and intensify the effects of both drugs.
- OxyContin, heroin, or GHB with ecstasy are Generation X speedball combinations.
- Nitrous oxide with ecstasy is used to intensify the inhalant rush.
- MDMA with Viagra® used enhance sexuality is called “sextacy.”

### 2. Parties, Festivals, Raves & Music Clubs

Raves are gatherings where patrons dance to loud computer-generated techno or electronic trance beat music, light shows and laser light effects are performed, and, at many, both club drugs and drug paraphernalia are condoned. Today some of the clubs have permanent locations and some are nomadic.

The most popular drugs at these gatherings are ecstasy, nitrous oxide (“laughing gas”), GHB or GBL, and occasionally dextromethorphan, ketamine, PCP, and nexus (2C-B). More traditional street drugs are also available, especially methamphetamine and marijuana. Alcohol is always available along with various prescription medications.

Most who attended these gatherings do not suffer adverse effects, they are there to enjoy the music, dance, and socialize. Incidents do sometimes occur including harmful physical reactions to drugs, overheating, falling injuries, passing out, bad psychedelic experiences, and mental destabilization.

### 3. 2C-T-7 & 2C-T-2

The common effects of these phenethylamine psycho-stimulant drugs are their ability to induce delirium, heighten sensitivity, and increase awareness in the user. Use can also cause dangerous cardiovascular effects and even death when taken in high doses.
The abuse of 2C-T-2, spread through “smart shops” in the Netherlands, Sweden, Germany, and Japan, led to its ban in the Netherlands in 1999.

4. Nexus (2C-B [CBR] or 4-bromo-2,5-dimethoxy phenylethylamine)
The effects of 2C-B are dependent on the amount taken: mild stimulation at low doses and intense psychedelic experiences at high doses. A number of users combine 2C-B and MDMA to intensify the experience.

5. PMA (4-MA or paramethoxyamphetamine)
Recently, PMA has been found in pills smuggled in from Europe purporting to be ecstasy. Effects of this short short-acting drug materialize after an hour and include a sudden rise in blood pressure, distinct after-images, and tingly sensations similar to pins-and-needles, a chill or hair standing on end.

6. STP (DOM) (2,5-dimethoxy-4-methylamphetamine)
STP, also called the "serenity," "tranquility," or “peace" pill, is similar to MDA. It causes a 12-hour intoxication characterized by intense stimulation and several mild psychedelic reactions. It was used in the 1960s and 1970s but is rarely used today because of the high incidence of bad trips.

VI. ANTICHLINERGIC PSYCHEDELICS (Belladonna, henbane, mandrake & datura [jimson weed, thornapple]) (PP. 6.17–6.18)
From ancient Greek times through the Middle Ages and the Renaissance, these plants, which contain hyoscyamine, atropine, and scopolamine, have been used in magic ceremonies, sorcery, witchcraft, and religious rituals. They have also been used as a narcotic, a diuretic, a sedative, an antispasmodic, a poison, to mimic insanity, and a beauty aid. The drugs block acetylcholine receptors causing a form of delirium and compromising the ability to visually focus. They also speed up the heart, cause intense thirst, and raise the body temperature to dangerous levels. Anticholinergics also create hallucinations, a separation from reality, and cause the user to fall into a deep sleep for up to 48 hours. Jimson weed is a bristly plant with coarse green leaves and white flowers that induces jerky movements, tachycardia, hypotension, and severe hallucinations such as imaginary snakes, spiders, and lizards. Few users try the drug twice.

VII. KETAMINE, PCP & OTHER PSYCHEDELICS (PP. 6.18–6.22)
Other lesser-known psychedelics fall in and out of favor depending on the generation and how strong their memory is of the reasons people originally quit using these drugs.
A. PCP (PHENCYCLIDINE HYDROCHLORIDE) (p. 6.18)

PCP was first used as a dissociative general anesthetic for humans, however, by the mid 60s the frequency and the severity of toxic and hallucinogenic effects limited the drug’s value to veterinary medicine. Today the only supplies are from illegal sources. PCP is often misrepresented as THC, mescaline, MDMA, or psilocybin. It can be smoked, snorted, swallowed, or injected.

PCP blocks sensory messages to the central nervous system, dissolving inhibitions, deadening pain, and causing a mind/body separation. Hallucinations (tactile, visual, or auditory) were reported by about 40% of users. The most alarming effects of PCP—self-inflicted injuries and violent run-ins with authorities—occur because of PCP’s dissociative effects.

A low dose of PCP lasts 1 to 2 hours, a moderate dose 4 to 6 hours, and a large dose, up to 48 hours.

B. KETAMINE (p. 6.19)

The effects of ketamine, a dissociative general anesthetic used in human and veterinary medical procedures, are very similar to those of PCP, its close chemical relative and predecessor, but do not last as long. Ketamine was the most common anesthetic used during the Vietnam War. Illegal use involves microwaving the liquid to create crystals that are then smoked in a crack pipe or snorted.

A “K-land” dose of 100 to 200 mg results in a mild dreamlike intoxication, a sensation of a mind/body separation, dizziness, initial free-floating giddiness, slurred speech, and impaired muscular coordination. A 300 to 500 mg dose produces the full psychedelic experience known as “being in a K-hole,” described as an out-of-body near-death encounter with depersonalization, hallucinations, delirium, and occasionally bizarre or mystical experiences. Users are also anesthetized against pain. Costs range from $100 to $200 per vial, or $20 to $25 per dose.

An overdose includes respiratory depression, increased heart rate and blood pressure, combative or belligerent behavior, convulsions, and in a few cases, coma.

Several researchers have used ketamine to treat alcoholism in a technique known as ketamine-assisted psychotherapy.

Rapid and dramatic development of tolerance, along with a profound psychic dependence, occurs with daily use of ketamine. Major effects last for about an hour, secondary effects include compromised coordination, judgment, and sensory perceptions lasting 18 to 24 hours.

C. SALVIA DIVINORUM (Salvinorin A) (p. 6.20)

Salvia’s unique psychic effects have been likened to a combination of various psychedelic drugs. Dried leaves and live cuttings are chewed and absorbed, causing dreamlike hallucinations, occasional delirium, and out-of-body sensations. When it is smoked, the major effects last for a few minutes, taper off after 7 to 10 minutes, and disappear within 30 minutes. An ounce of Salvia divinorum can be extracted from 100 to 200 leaves,
enough for 4 to 12 doses. Salvinorin A is thought to be the key psychoactive chemical. It takes 3 lbs. of leaves to make 1 oz. of salvinorin A extract. Some countries such as Germany and Australia regulate its use. As of 2010 it was legal in the United States but not for human consumption. Most users are high school or college students.

D. AMANITA MUSHROOMS (pp. 6.20–6.21)
The *Amanita muscaria* is a large mushroom with an orange, tan, red, or yellow cap with white spots. It can cause dreamy intoxication, hallucinations, delirious excitement, and can have a deadly physical toxic effect.
The *Amanita* mushroom is one of the few psychedelics that can be sold legally in the United States but only for their historical and ethnobotanical interest; they are listed as a poison by the FDA making them illegal to sell for human consumption. A person can buy an ounce of minced Amanita mushrooms over the internet for about $15.

E. DEXTROMETHORPHAN (Robitussin DM, ® Romilar® & other cough syrups) (p. 6.21)
Dextromethorphan, an opioid, is an ingredient in many nonprescription cough suppressants. High concentrations cause psychoactive and psychedelic effects. A 300 to 600 mg dose causes effects that will last for 6 to 8 hours.
Intense mental effects include euphoria, mind/body separation, auditory and visual hallucinations, and a loss of coordination. Overdoses can occur. Naloxone has been used to treat overdoses.

F. NUTMEG & MACE (p. 6.21)
At the low end of the psychedelic drug spectrum are nutmeg and mace, both from the nutmeg tree (*myristica fragrans*). They can cause varied effects from a mild floating sensation to a full-blown delirium. Huge quantities must be consumed (about 20 g) to generate any effects leaving the user with a bad hangover and a severely upset stomach. Abuse is extremely rare outside of prison.

G. BROMO-DRAGONFLY (p. 6.21)
Sometimes referred to as FLY or B-FLY, this phenethylamine psychedelic is more potent and longer-lasting than other phenethylamines. It causes hallucinations, visual distortions, muscle tension, memory loss, confusion and acute anxiety. Effects last from six hours to four days.

H. LEONOTIS LEONURUS (Lion's Tail, Wild Dagga) (p. 6.22)
This South African bush has effects similar to marijuana (e.g., lightheadedness, giddiness, mild euphoria, and mild hallucinogenic effects). As of 2011, dried leaves and seeds were legally available online.
I. EFAVIRENZ (Sustiva®: HIV/AIDS medication) (p. 6.22)
Used to treat AIDS and HIV, this protease inhibitor causes lightheadedness, dizziness, vivid dreams, hallucinations, depersonalization, relaxation and forgetfulness. The psychedelic effects occur in 25% of users. This drug is usually diverted from legitimate suppliers or stolen from AIDS/HIV patients.

VIII. MARIJUANA & OTHER CANNABINIODS (PP. 6.22–6.40)

A. HISTORY OF USE (pp. 6.22–6.25)
From its probable origin in China or central Asia, hemp cultivation has spread to almost every country in the world. There are a variety of species; some Cannabis plants are better for fiber, some for food, some for medications, and some for inducing psychedelic effects.
Over succeeding millennia, Cannabis continued to be used in all its forms. In third-century Rome, ropes and sails for ships’ riggings were made from hemp fiber. Cannabis was widely cultivated in America until the nineteenth century, when the end of slavery made it less profitable. Because it was not banned in the Qur'an by the Prophet Mohammed, Islamic cultures spread its use to Africa and Europe.
After World War I, migrant laborers who worked in the United States introduced the habit of smoking marijuana for its psychoactive effects.
As a result of newspaper articles written to scare the public, and a prohibitionist attitude, the use of Cannabis (except for sterilized birdseed) was banned by the Marijuana Tax Act of 1937.

B. EPIDEMIOLOGY IN THE UNITED STATES (p. 6.25)
In 1960, only 3 to 4 million people had tried any illegal drug. By 1979, 68 million people had tried marijuana. By 1992, the monthly rate of use dropped to one-third of its 1979 peak. By 2008, more than 15.2 million Americans were using marijuana on a monthly basis. According to the Drug Abuse Warning Network, more than 374,000 visits to emergency rooms listed marijuana as a contributing factor up from just 80,000 10 years earlier. In addition, 33% to 50% of adult male arrestees tested positive for marijuana.

C. BOTANY (pp. 6.25–6.28)
1. Species
Cannabis is the botanical genus of a number of species. Hemp is used to describe Cannabis plants that are high in fiber content. Marijuana is used to describe Cannabis plants that are high in psychoactive resins.
Cannabis sativa, Cannabis indica, and Cannabis ruderalis are the three species referenced in this textbook.
The most common species, Cannabis sativa is grown in tropical, subtropical, and temperate regions throughout the world. Variations of Cannabis sativa have sufficient quantities of active resins to cause
psychedelic phenomena other variations have a high concentration of fiber and are used for hemp.

The second species, *Cannabis indica*, sometimes called “Indian hemp,” is a shorter, bushier plant and is the source of most of the world’s hashish. Many illegal growers prefer *Cannabis indica* as the base plant for cultivating sinsemilla.

The third species, *Cannabis ruderalis* (weedy hemp), a small thin plant, has a small amount of THC and is especially plentiful in Siberia and western Asia

2. Sinsemilla & Other Forms of Marijuana

The sinsemilla growing technique increases the potency of the marijuana plant and is used in the cultivation of both *Cannabis indica* and *Cannabis sativa*. The sinsemilla technique involves separating female plants from male plants before pollination. Dried marijuana buds, leaves, and flowers are crushed and rolled into “joints” or smoked in pipes. In India, there are three preparations of marijuana:

- **Bhang** - from the stem and the leaves, has the lowest potency.
- **Ganja** - from the stronger leaves and the flowering tops.
- **Charas** - the concentrated resin from the plant and is the most potent. This sticky resin is pressed into cakes and called “hashish.” The resin contains most of the psychoactive ingredients.

Hash oil can be extracted from the plant (using solvents) and added to foods. The THC concentration of hash oil has been measured as high as 70%.

3. Growers

The majority of the marijuana used in the United States comes from Mexico and Colombia. Mexican drug trafficking organizations (DTOs) have growing operations in the rich soils of remote U.S. forests. Plantings that have been discovered contained anywhere from 2,000 to 10,000 plants. In the United States, 10% to 50% of the available marijuana is homegrown. Heightened surveillance moved some outdoor operations indoors, 451,000 plants have been seized from indoor grows and 7,562,000 from outdoor grows. Some marijuana is grown hydroponically (in water).

The advent of indoor growing led to a supply of very high-potency plants worldwide. The average potency of marijuana has risen to 10.14% in 2008. The common unit of sale is 1 oz. (a “lid”), the average street price in the United States ranges from $200 to $400 per “lid.” Street prices for smaller amounts average $10 a gram (28.3 g equals 1 oz.) one-eighth of an ounce – the most common measure (about 3 to 4 grams) goes for $50 to $60. The profits are enormous: 500 lbs. of marijuana bought in Mexico for $50,000 can bring $400,000 in St. Louis.

Medical marijuana purchased at legitimate dispensaries costs about $40 to $60 for an eighth of an ounce.
D. SYNTHETIC MARIJUANA (pp. 6.28–6.29)

1. Synthetic THC
Synthetic THC, called dronabinol (Marinol®) or Cesamet,® is available to treat medical conditions such as glaucoma and multiple sclerosis. Patients prefer smoking it or eating it in food in order to control their intake. A third synthetic THC, Sativex, was developed to be used in a spray inhaler.

2. Designer Cannabinoids
These are synthetic cannabinoid-like chemicals sold over the Internet and in head shops as incense or herbal smoking blends under a variety of trade names like K2,® Spice Gold,® and Yucatan Fire.® These compounds do not test positive for marijuana so they became popular in Europe and the United States, but increasing legal restrictions by more than a dozen states and a number of other countries are making them scarcer.

E. PHARMACOLOGY (pp. 6.29–6.30)
Researchers have discovered more than 420 chemicals in a single Cannabis plant. At least 30 of these chemicals, called cannabinoids, have been studied for their psychoactive effects. When smoked or ingested, these potent psychoactive chemicals are converted by the liver into more than 60 other metabolites.
The most potent psychoactive chemical is ∆-9-tetrahydro-cannabinol, or THC. Cannabinol and cannabidiol are other prominent cannabinoids, but they are not thought to have psychoactive properties.

1. Marijuana Receptors & Neurotransmitters
In 1988 and 1990, researchers detected receptor sites in the brain that were specifically reactive to THC, implying that the brain had its own natural neurotransmitters that fit into these receptor sites.
Two years later the discovery of anandamide, an endocannabinoid that fits into the cannabinoid receptor sites, was discovered. A few years later, another endocannabinoid was discovered - 2AG which is more abundant but not as active as anandamide.
The receptors for anandamide include CB₁ and CB₂ receptors. CB₁ receptors are found mostly in areas of the brain that regulate the integration of sensory experiences with emotions as well as those controlling functions of learning, memory, a sense of novelty, motor coordination, and some automatic bodily functions. CB₂ receptors seem to be limited to the immune system and a few other sites in the lower body.
It is uncommon to physically overdose on marijuana because receptors are scarce in the part of the brain that controls respiration and blood pressure.
F. SHORT-TERM EFFECTS (pp. 6.30–6.32)

1. Physical Effects
Physical relaxation or sedation, some pain control, bloodshot eyes, lung irritation, an increase in appetite, and a small to moderate loss of muscular coordination are common. Other physical effects include increased heart rate, decreased blood pressure, and decreased eye pressure.
Marijuana impairs tracking and causes a trailing phenomenon producing afterimages of a moving object. These effects impede the ability to perform tasks that require depth perception and hand/eye coordination.
Marijuana can act as a stimulant as well as a depressant, depending on the variety and the amount of chemical that is absorbed in the brain, the setting in which it is used, and the personality of the user.
Flooding CB\textsubscript{1} receptors in the hypothalamus with THC increases the appetite. Smoking marijuana does not sharpen one’s sense of taste, but it does enhance the sensory appeal of foods, especially in a friendly environment.

2. Mental Effects
Within a few minutes of smoking marijuana, the user becomes confused and mentally separated from the environment. Additional effects include drowsiness, detachment, and difficulty concentrating.
Very potent marijuana can produce giddiness, increased alertness, and major distortions of time, color, and sound, and excessively strong doses have been known to produce a sensation of movement under one’s feet, visual illusions, and sometimes hallucinations. Paranoia and depersonification can also occur.
Marijuana is referred to as “the mirror that magnifies” because it exaggerates mood and personality and makes smokers more empathetic to others’ feelings. It also makes smokers more suggestible.
The effects of THC on the amygdala, the emotional center of the brain, are key to understanding many of marijuana’s effects.

3. Novelty
Part of the amygdala’s function is judging the emotional significance of objects and ideas encountered in a person’s environment. THC artificially stimulates the CB\textsubscript{1} receptors in the amygdala, making even mundane objects interesting, - “virtual novelty.”
When too much marijuana is used, receptors react by retracting into the cell membrane and becoming inactive (down regulation). The chronic user will perceive things that are truly novel as mundane and boring. To regain the perception of novelty, one has to continue to use
4. Memory & Learning

Normally, the hippocampus stores current sensory input for immediate use before it is shifted to long-term memory. The body’s own anandamide determines how much of the hippocampus is available. When an external cannabinoid like THC is taken into the body, it severely limits the available amount of hippocampal short-term memory. As use is discontinued, the short-term memory is usually restored.

Although marijuana slows learning and disrupts concentration because of its influence on short-term memory, it has a lesser effect on long-term memory. A recent study of 150 heavy marijuana users in treatment, found that memory, attention span, and cognitive functioning were impaired. However, smokers have the incorrect perception that they are learning and thinking at levels much higher than reality suggests.

Marijuana affects the juvenile brain more severely than the adult brain. At the age of about 12, there is an explosion in the number of connections and synapses among the nerve cells in the brain. The ability to hone in on things that are important and ignore things that are not is reduced over time, impairing a person’s ability to judge danger.

5. Time

The distortion of a sense of time (temporal disintegration) is responsible for several of the perceived effects of marijuana. Dull monotonous jobs seem less repetitive. On the other hand, a student who smokes marijuana while studying (a more complex activity) often becomes bored and abandons the task.

Marijuana impairs a user’s ability to perform multiple and interactive tasks, like installing a computer program while under the influence.

G. LONG-TERM EFFECTS (pp. 6.32–6.34)

1. Respiratory Problems

Regularly smoking marijuana causes coughing and other symptoms of acute and chronic bronchitis. Dr. Donald Tashkin of UCLA determined through microscopic studies of these mucous membranes, that most damage occurs in the lungs of those who smoke both cigarettes and marijuana; approximately 75% of marijuana smokers also smoke cigarettes.

Marijuana smoking damages lung tissue but whether it causes cancer is unclear. In 2006, Dr. Tashkin and other researchers found no link between exclusive marijuana smoking and lung cancer, even among heavy marijuana smokers.

2. Immune System

Epidemiologic studies identify marijuana as a cofactor in the progression of HIV infection. Another animal study found that THC can lead to enhanced growth of tumors, including those associated with breast cancer, due to suppression of the anti-tumor immune response. It could
be counterproductive for patients who are already immune depressed to smoke marijuana for therapeutic purposes.

3. Acute Mental Effects
There is a debate over whether marijuana can cause a serious mental illness. A pre-existing mental problem complicates the precipitating influence of marijuana. Often the use of high THC marijuana will tip the mental balance of someone who is just holding on. Counselors reported treating people who experienced a bad trip and did not come all the way back.

Even veteran smokers who commonly smoke low-grade “pot” may feel that somebody has slipped them a psychedelic like PCP or LSD when they smoke strong “BC bud” sinsemilla. They can experience extreme anxiety and paranoia.

H. TOLERANCE, WITHDRAWAL & ADDICTION (p. 6.34−6.36)

1. Tolerance
Tolerance to marijuana occurs rapidly, even though smokers are initially more sensitive, not less, to desired effects (inverse tolerance). High-dose chronic users can tolerate much higher levels without some of the more severe emotional and psychic effects experienced by first-time users.

2. Withdrawal
Withdrawal from marijuana is a lengthy process because much of the THC is retained in the brain and only after a relatively long period of abstinence will the withdrawal effects appear.

The discovery in 1994 of an antagonist that instantly blocks the effects of marijuana enabled researchers to search for true signs of tolerance, tissue dependence, and withdrawal symptoms in long-term users. Experiments indicate that marijuana dependence occurs more rapidly than previously suspected.

Withdrawal effects include:
- anger, irritability, anxiety, and/or aggression;
- aches, pains, chills;
- depression;
- inability to concentrate;
- craving, etc.

3. Addiction
More sophisticated sinsemilla cultivation techniques led to higher THC concentrations which increases the compulsive liability of marijuana use. Psychological addiction is more of a factor than physical addiction. Today many people smoke the drug in a chronic, compulsive way and have difficulty discontinuing their use.
4. Is Marijuana a Gateway Drug?
The exaggerations of use portrayed in early anti-drug films and collateral material resulted in ridicule and probably caused more drug abuse than it prevented. These misguided prevention efforts also obscured an important fact: the real role that marijuana use plays in future drug use and abuse.

Marijuana is considered a gateway drug because people who smoke it commonly hang around others who smoke it or use other drugs, so the opportunities to experiment with other drugs are greater.

A study of 311 young adult identical or fraternal twins in Australia found that those who smoked cannabis by age 17 had a 2.1 to 5.2 higher chance of other drug use, alcohol dependence, and drug abuse/dependence than those who didn’t smoke it. It could also be that those who are likely to smoke marijuana are 2.1 to 5.2 times more likely to experiment with other drugs.

I. MARIJUANA (Cannabis) & the Law (p. 6.37 – 6.37)
In the United States, the state and federal penalties for marijuana use vary. Federal law focuses more on heavy trafficking, although there are penalties for simple possession and personal use.

Austria, Belgium, Germany, Greece, Ireland, Italy, and Spain don’t prosecute for possession of small amounts for personal use.

In England the maximum sentence for Cannabis possession is a five-year prison term, though most sentences handed down are minimal.

In the Netherlands, use is confined to the coffee shop system.

Worldwide, the push for the medical use of marijuana has caused a reassessment of many of the legal penalties for sale (e.g., medical marijuana clubs) and use.

1. Marijuana, Driving & Drug Testing
Repetitive tasks such as uneventful driving on familiar streets are do not present a problem while under the influence of marijuana, but when a complicated driving situation arises, requiring decision-making and swift reaction, the chances of error are significantly increased.

Adverse effects of marijuana are magnified by polydrug use. 65% of heavy drinkers also use marijuana, which is the reason positive polydrug tests are the rule, not the exception, in drivers arrested for driving while under the influence.

Tests showed lower levels of impairment in drivers who smoked a small amount of marijuana compared with those who drank a small amount of alcohol. However, drinking boosts overconfidence whereas marijuana makes drivers overly wary and sometimes paranoid.

Testing machines can measure minute amounts of the THC metabolite but are generally calibrated to start registering at 50 nanograms per milliliter (ng/mL) in urine samples. It would take about 3 weeks before
Long term smokers who quit would still register for 3 weeks on a test with a 50 ng/mL cutoff, it would take another 3 weeks to be completely negative. The Olympic Committee uses just 15 ng as its cutoff level.

**J. MEDICAL USE OF MARIJUANA (pp, 6.37–6.40)**

1. Epidemiology & dispensaries

More than 16 states have legalized medical marijuana. As of 2010, Colorado had issued 66,000 medical marijuana cards while Oregon had issued 40,000. The states are considering ways to make money on this new trade, regardless of the attitude towards drugs. Fees, licensing, and excise taxes add millions and billions of dollars to state budgets. Once a person has been issued a card, they can purchase from dispensaries, individual growers, and/or buyer's clubs. In addition to smokable marijuana, "medibles" are also available - brownies, cookies, butter, and soft drinks are laced with marijuana and sold to the cardholders. Federal law conflicts with state law on this issue and the Supreme Court ruled that individuals could be prosecuted for breaking federal law.

2. Medical Effects

Over the past 150 years, the medical profession has examined the use of Cannabis and its extracts for medicinal purposes.

Historically, marijuana has been used as a muscle relaxant, painkiller, appetite stimulant, to control spasms and convulsions, to calm anxiety, to control glaucoma, etc. Passage of the Marijuana Tax Act of 1937 discouraged further research until the 1980s.

By 1996, a number of states had passed laws permitting medicinal use of the drug. Research today has explored, and in some cases recommended, the use of Cannabis for some types of glaucoma, nausea, pain control, to subdue uncontrolled movements (e.g., multiple sclerosis), and to stimulate weight gain for wasting illnesses such as cancer and AIDS. The focus of recent research is on the other cannabinoids particularly cannabidiol or CBD.

3. Rationale For & Against Medical Marijuana

The variation in the number of active ingredients complicates efficacy of smoking or ingesting marijuana for medical purposes.

It is often the mental effects of calming, anxiety relief, or mild euphoria that make people feel good and think they are getting better.

Marijuana is a psychoactive drug with dependency potential, which makes its use particularly risky for those who are recovering from abuse or addiction.
Chapter 6 – ALL AROUNDERS

Classroom or Small Group Discussion Topics

1. Ask students to list three reasons a person might use
   - MDMA “Ecstasy”
   - Marijuana
   - Ketamine

2. Discuss the pros and cons of legalizing LSD for (a.) medical use, (b.) recreational use.
   Should it be available to psychologists and psychiatrists as a controlled substance limited to experimentation to determine its value as a therapeutic agent?

3. Should the use of psychedelics for religious purposes (e.g., the Native American Church's use of peyote) be legal? Must a church be well established with a minimum number of members to qualify?

4. Explore how the use of MDMA could be beneficial in teaching empathy to (a.) adolescents, or (b.) adults.

5. What makes marijuana “the mirror that magnifies”?

6. How would the effect of marijuana on the novelty center affect a student’s ability to pay attention in class even if they were not under the influence at the time.

7. Discuss medical marijuana:
   - Are the criteria for qualifying for a medical marijuana card (where it is legal) fair? Could the process be abused?
   - Would taking medical marijuana in a spray form be as appealing to people as smoking it?
   - How much of the benefit of marijuana comes from its ability to induce a relaxed mental state? A relaxed physical state? Its ability to produce a disorienting high?

8. What are the students’ attitudes/positions on psychedelics, - do they differ from their thoughts regarding uppers, like cocaine, and downers, like alcohol?
Chapter 6 - ALL AROUNDERS

Critical Thinking & Class Exercises

1. Have your students research the MK-ULTRA program conducted by the CIA to explore the use of psychedelic drugs as a weapon during the Cold War.
   - Is it acceptable for governments’ to do this kind of research and to use it in warfare? Why or why not?
   - Is it acceptable to use a psychedelic like LSD to get a prisoner to talk? To get a “terrorist” to talk?

2. Examine the concept of synesthesia - provide students with colorful markers or crayons and blank paper.
   - Play portions of a variety of music genres (classical, country, Indian etc.) while students visually interpret the music.
   - Replicate everyday sounds (e.g. creaking door, train, traffic, birds) and ask the students to draw what those sounds might look like.
   - Ask students what sounds reflect a particular color. (*sweet sounds might be a pastel, violent sounds might be deep purple*)

3. If a non-addictive, nontoxic, low-cost, short-term psychedelic is invented, should it be legalized?
   - Process their discussion to see how it reflects currently available drugs that fit this category such as Salvia Divinorum.
   - What specific effects of psychedelic drugs make them illegal?

4. Break into groups of 2 to 4 and discuss what advice they would offer a younger relative who asks if it is OK to use marijuana.
   - Would the answer be different if the drug were LSD? Why or why not?