Medical marijuana and the mind

*Harvard Mental Health Letter*

*More is known about the psychiatric risks than the benefits.*

The movement to legalize marijuana for medical use in the United States has renewed discussion about how this drug affects the brain, and whether it might be useful in treating psychiatric disorders.

Unfortunately, most of the research on marijuana is based on people who smoked the drug for recreational rather than medical purposes. A review by researchers in Canada (where medical
marijuana is legal) identified only 31 studies (23 randomized controlled trials and eight observational studies) specifically focused on medical benefits of the drug.

A separate review by the American Medical Association (AMA) also concluded that the research base remains sparse. This was one reason that the AMA urged the federal government to reconsider its classification of marijuana as a Schedule 1 controlled substance (prohibiting both medical and recreational use), so that researchers could more easily conduct clinical trials.

Consensus exists that marijuana may be helpful in treating certain carefully defined medical conditions. In its comprehensive 1999 review, for example, the Institute of Medicine (IOM) concluded that marijuana may be modestly effective for pain relief (particularly nerve pain), appetite stimulation for people with AIDS wasting syndrome, and control of chemotherapy-related nausea and vomiting.

Given the availability of FDA-approved medications for these conditions, however, the IOM advised that marijuana be considered as a treatment only when patients don’t get enough relief from currently available drugs. Additional research since then has confirmed the IOM’s core findings and recommendations.

Although anecdotal reports abound, few randomized controlled studies support the use of medical marijuana for psychiatric conditions. The meager evidence for benefits must be weighed against the much better documented risks, particularly for young people who use marijuana.

Key points

Medical marijuana may be an option for treating certain conditions, such as nerve pain or chemotherapy-related nausea.

There is not enough evidence to recommend medical marijuana as a treatment for any psychiatric disorder.

The psychiatric risks are well documented, and include addiction, anxiety, and psychosis.

Challenges in drug delivery

Marijuana is derived from the hemp plant, Cannabis. Although marijuana contains more than 400 chemicals, researchers best understand the actions of two: THC (delta-9-tetrahydrocannabinol) and cannabidiol.

THC is the chemical in marijuana primarily responsible for its effects on the central nervous system. It stimulates cannabinoid receptors in the brain, triggering other chemical reactions that underlie marijuana’s psychological and physical effects — both good and bad.

Less is known about cannabidiol, although the research suggests that it interacts with THC to produce sedation. It may independently have anti-inflammatory, neuroprotective, or antipsychotic effects, although the research is too preliminary to be applied clinically.
Drug delivery remains a major challenge for medical marijuana. The FDA has approved two pills containing synthetic THC. Dronabinol (Marinol) combines synthetic THC with sesame oil. Most of the active ingredient is metabolized during digestion, however, so that only 10% to 20% of the original dose reaches the bloodstream. Nabilone (Cesamet) uses a slightly different preparation of synthetic THC that is absorbed more completely into the bloodstream. Among the concerns about both of these drugs, however, are that they do not work rapidly, and the amount of medication that reaches the bloodstream varies from person to person.

Another medication under investigation in the United States (and already approved for sale in Canada) combines THC and cannabidiol. In Canada, it is marketed as Sativex. This drug is sometimes referred to as “liquid cannabis” because it is sprayed under the tongue or elsewhere in the mouth, using a small handheld device. However, it takes time to notice any effects, as the drug has to be absorbed through tissues lining the mouth before it can reach the bloodstream.

Inhalation is the fastest way to deliver THC to the bloodstream, which is why patients may prefer smoking an herbal preparation. But while this method of drug delivery works fast, smoking marijuana exposes the lungs to multiple chemicals and poses many of the same respiratory health risks as smoking cigarettes. Limited research suggests that vaporizers may reduce the amount of harmful chemicals delivered to the lungs during inhalation.

More psychiatric risk than benefit

Part of the reason marijuana works to relieve pain and quell nausea is that, in some people, it reduces anxiety, improves mood, and acts as a sedative. But so far the few studies evaluating the use of marijuana as a treatment for psychiatric disorders are inconclusive, partly because this drug may have contradictory effects in the brain depending on the dose of the drug and inborn genetic vulnerability.

Much more is known about the psychiatric risks of marijuana (whether used for recreational or medical purposes) than its benefits.

Addiction. Observational studies suggest that one in nine people who smokes marijuana regularly becomes dependent on it. Research both in animals and in people provides evidence that marijuana is an addictive substance, especially when used for prolonged periods.

Addiction specialists note with concern that THC concentration has been increasing in the herbal form of marijuana. In the United States, THC concentrations in marijuana sold on the street used to range from 1% to 4% of the total product; by 2003, average THC concentration had risen to 7%. Similar trends are reported in Europe. This increased potency might also accelerate development of dependence.

Less conclusive is the notion that marijuana is a “gateway drug” that leads people to experiment with “hard” drugs such as cocaine. The research is conflicting.

Anxiety. Although many recreational users say that smoking marijuana calms them down, for others it has the opposite effect. In fact, the most commonly reported side effects of smoking marijuana are intense anxiety and panic attacks. Studies report that about 20% to 30% of
recreational users experience such problems after smoking marijuana. The people most vulnerable are those who have never used marijuana before.

Dose of THC also matters. At low doses, THC can be sedating. At higher doses, however, this substance can induce intense episodes of anxiety.

It is not yet known whether marijuana increases the risk of developing a persistent anxiety disorder. Observational studies have produced conflicting findings. Studies of recreational users suggest that many suffer from anxiety, and it’s difficult to know what underlies this association. Possibilities include selection bias (e.g., that anxious people are more likely to use marijuana), a rebound phenomenon (e.g., that marijuana smokers feel worse when withdrawing from the substance), and other reasons (e.g., genetic vulnerability).

**Mood disorders.** Little controlled research has been done about how marijuana use affects patients with bipolar disorder. Many patients with bipolar disorder use marijuana, and the drug appears to induce manic episodes and increases rapid cycling between manic and depressive moods. But it is not yet clear whether people who use marijuana are at increased risk of developing bipolar disorder.

The small amount of research available on depression is also muddied. In line with what studies report about anxiety, many marijuana users describe an improvement in mood. Animal studies have suggested that components of marijuana may have antidepressant effects. Yet several observational studies have suggested that daily marijuana use may, in some users, actually increase symptoms of depression or promote the development of this disorder.

For example, an Australian study that followed the outcomes of 1,601 students found that those who used marijuana at least once a week at ages 14 or 15 were twice as likely to develop depression seven years later as those who never smoked the substance — even after adjusting for other factors. Young women who smoked marijuana daily were five times as likely to develop depression seven years later as their non-smoking peers. Although such studies do not prove cause and effect, the dose-outcomes relationship is particularly worrisome.

**Psychosis.** Marijuana exacerbates psychotic symptoms and worsens outcomes in patients already diagnosed with schizophrenia or other psychotic disorders. Several large observational studies also strongly suggest that using marijuana — particularly in the early teenage years — can increase risk of developing psychosis.

An often-cited study of more than 50,000 young Swedish soldiers, for example, found that those who had smoked marijuana at least once were more than twice as likely to develop schizophrenia as those who had not smoked marijuana. The heaviest users (who said they had used the drug more than 50 times) were six times as likely to develop schizophrenia as the nonsmokers.

Until recently, the consensus view was that this reflected selection bias: Individuals who were already vulnerable to developing psychosis or in the early stages (the prodrome) might be more likely to smoke marijuana to quell voices and disturbing thoughts. But further analyses of the Swedish study, and other observational studies, have found that marijuana use increases the risk of psychosis, even after adjusting for possible confounding factors.
Although cause and effect are hard to prove, evidence is accumulating that early or heavy marijuana use might not only trigger psychosis in people who are already vulnerable, but might also cause psychosis in some people who might not otherwise have developed it.

Certainly genetic profile mediates the effect of marijuana. People born with a variation of the gene COMT are more vulnerable to developing psychosis, for example. Because there is as yet no reliable way for clinicians to identify vulnerable young people in advance, however, it is safest to restrict use of medical marijuana to adults.

Other effects

A review of side effects caused by medical marijuana found that most were mild. When compared with controls, people who used medical marijuana were more likely to develop pneumonia and other respiratory problems, and experience vomiting, and diarrhea.

There’s no question that recreational use of marijuana produces short-term problems with thinking, working memory, and executive function (the ability to focus and integrate different types of information). Although little research exists on medical marijuana, anecdotal reports indicate that some patients take the drug at night to avoid these types of problems.

The real debate is about whether long-term use of marijuana (either for medical or recreational purposes) produces persistent cognitive problems. Although early studies of recreational users reported such difficulties, the studies had key design problems. Typically they compared long-term marijuana smokers with people who had never used the drug, for example, without controlling for baseline characteristics (such as education or cognitive functioning) that might determine who continues to smoke the drug and who might be most at risk for thinking and memory problems later on.

Studies suggest that although overall cognitive ability remains intact, long-term use of marijuana may cause subtle but lasting impairments in executive function. There is no consensus, however, about whether this affects real-world functioning.

Additional research, focused on the benefits and consequences of medical marijuana use for specific disorders, may help to clarify some issues. In the meantime, there is not enough evidence to recommend marijuana as a medical treatment for any psychiatric disorder.


For more references, please see www.health.harvard.edu/mentalextra.
Mind-Enhancements of a Cannabis High

Countless users of cannabis have profited from a cannabis high. Charles Baudelaire, William Butler Yeats, Walter Benjamin, Louis Armstrong, Billie Holiday, Diego Rivera, The Beatles, Bob Marley, Carl Sagan, and many others used cannabis to change their perception, to gain deep insights, to create, write, compose, and perform.[1]

The Beatles

In the following I will list what I think to be the ten most prominent mind enhancements reported by cannabis users throughout history.[2]

First, however, a note of caution: as with other mind-enhancing substances, there certainly is no “total enhancement” of mental abilities during a high. Some cognitive abilities are enhanced, while the performance of other processes may decline. It depends on the skill and knowledge of a user to integrate the high into one’s life so that he or she can actually profit from various alterations in thought and perception.

So, here is the list of ten of the most useful mind-enhancements coming from a cannabis high:
1. Enhanced Focus of Attention

During a high, cannabis users hyperfocus on whatever comes to their attention—be it a sensation, a thought, or a memory. We experience more depth and detail in whatever we perceive or think about. The Belgian poet and painter Henri Michaux experimented a lot with hashish and noted that

“(w)ith Hashish in me I am a falcon. (...) I look for an object in order to follow a trail. If it is a face, then through that face I will follow the trail to the ends of the earth. Nothing can distract me.”[3]

Belgian writer and painter Henri Michaux (1899-1984)

2. Intensified Sensations

The “hyperfocus” effect on attention presumably plays a major role in the often reported subjective intensification of sensory experiences during a high. Being high you also better discriminate new aspekte in your sensations—be it the flavor of a mango, the smell of a pine tree, or the tactile sensation of a kiss.

3. Being in the “Here-and-Now”

Your focused attention and the intensification of experience help you to dwell in the here-and-now of existence. You concentrate on your sensory experience and on your bodily awareness. Past and future become less important. You breathe, feel, perceive, and re-connect with yourself. I have also called this the “Zen-effect” of cannabis.

4. Enhanced Episodic Memory

The often reported enhancement of episodic memory is one of the most stunning effects of a cannabis high. While you can use a high to come to the actual “here-and-now” of existence, you can also redirect
Marijuana and the Brain

your attention to past episodes to bring yourself back to the “here-and-now” of the past. Cannabis users often remember long gone episodes of their lives with incredible detail and vividness. Interestingly, users have often reported re-living even childhood experiences as if the high had transported them back to their former selves.

5. Enhanced Imagination

Another incredibly useful effect of the cannabis high is the intensification of your imaginative abilities. We tend to underestimate the magnificent potential of this enhancement. First, we tend to think of imagination only as the ability to visualize images. But our ability to imagine also includes our ability to imagine how flavors of rosemary and potatoes combine, the tactile feeling of jumping in a cold lake, or the sound of a melody in the composition process.

Second, we use our imagination not only to dream up situations. As neuroscientists like Michael Gazzaniga and Antonio Damasio have reminded us, we crucially need our imagination to make decisions on an every-day basis. When you decide to marry your girlfriend you go through imagining situations, how it would be to live with her for the rest of your life, how your girlfriend would be as a mother, etc..

6. Enhanced Pattern Recognition

Countless users have reported perceiving new patterns during a high; patterns in nature, in art, in their own behavior or in the behaviors of others. Needless to say that this is one of the crucial enhancements of a cannabis high. It can also be used to break with routines and addictions. Once you understand the patterns of your own habits and routines, you can transcend them.

7. Enhanced Introspective Abilities

Many cannabis users described that a cannabis high helped them to better introspect bodily sensations; they reported how they feel cold water going down their throat, or better felt how the heat of a sauna or stretching helps them to relax their muscles. Others have reported deep insights into their own character, their moods or emotions. An enhanced pattern recognition seems to be a crucial element in this introspective enhancement.

8. Enhanced Empathic Understanding

Humans have incredible empathic skills. We can read emotions and moods from facial expressions or from seeing a bodily posture or walking style. We have countless detailed reports from users that a
Marijuana and the Brain

cannabis high helped them to put them in the shoes of others, to understand how others tick and feel. Recently, some courageous mothers have started to treat their strongly autistic children with cannabis with much success. During a cannabis high, these children seem to respond well, hold eye contact, start playing with other kids instead of engaging in solitary play, and seem to generally better understand others. After years of research I found the enhancement of empathic understanding to be such a profound effect of cannabis that I came up with the hypothesis that the endocannabinoid system might play a fundamental role in the functionality of the mirror neuron system or any other cognitive system which underlies our ability to empathically understand others.[4]

9. Enhanced Lovemaking

Many users have reported that a cannabis high enhanced their experience of lovemaking. Looking at the enhancements above it should now be easy to see why. High lovers are more in the here-and-now of existence, concentrate on their partners and understand them better, their tactile sensations become more intense and richer in depth; they can explore the trip of an orgasm better, they break with habitual patterns, listen to their partners, and try out new things. Mindracing and the perception of a slowdown of time (effects that I have described elsewhere)[5] play an important role:lovemaking and the experience of orgasm seem to be timeless, eternal.

10. Enhanced Creativity and Insights

Carl Sagan famously reported in an anonymously published essay “Mr. X” that he had insights on the invalidity of racism during a cannabis high and used soap to draw a Gaussian distribution curve on his shower wall to illustrate his point In my book “High. Insights on Marijuana” I have explained in detail how I believe cannabis can help with insights. There is a long tradition in psychology that explores the phenomenon of spontaneous insights since the early days of the German psychologist Max Wertheimer’s Gestalt psychology school. If we take a closer look of this tradition and also look at newer studies on insights,[6] and the list of cognitive enhancement during a high, it becomes quite obvious in which ways cannabis can help users to come to deep spontaneous insights about all kinds of issues.

[1] For a great collection of other prominent cannabis users see www.veryimportantpotheads.com/

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Scientists Discover Another Way Marijuana Helps The Brain Grow

Research shows for the first time that CBD, like THC, can promote the growth of brain cells.

In 2005, Canadian researchers made a groundbreaking discovery that would forever discredit the myth that marijuana causes brain damage. What they found was an opposite effect. That is, THC – the main chemical in marijuana and the reason why users get ‘high’ – can actually cause new brain cells to grow.

The process of brain growth is called neurogenesis and does not usually improve with drug use. Marijuana use is a different story, explained Xia Zhang, M.D, Ph.D., associate professor at the University of Saskatchewan and lead author of the study:

"Most ‘drugs of abuse’ suppress neurogenesis. Only marijuana promotes neurogenesis."

Still, THC is not the only chemical found in marijuana and, eight years later, a team from Brazil is giving marijuana users more reason to celebrate. Their study, published in the July issue of The International Journal of Neuropsychopharmacology, shows that cannabidiol (CBD) can help your brain grow too.

Looking to investigate the effects of CBD on anxiety and depression in rodents, the researchers went to the source – a part of the brain called the hippocampus. The
Marijuana and the Brain

The hippocampus regulates emotion and cognitive function and is also the only area of the adult brain that can grow.

While previous studies have found CBD to have beneficial effects on anxiety and depression, the new study is the first to explain why.

What the scientists found was that CBD, just like THC, also causes brain cells in the hippocampus to grow. This, they say, could explain why previous studies identified CBD as an effective treatment for mood disorders.

“Our results indicate that chronic CBD administration, by promoting neurogenesis, favours a similar anxiolytic response in stressed mice.”

Likewise, other studies have linked depression, anxiety and stress – and even problems with learning and memory – to a lack of adult neurogenesis. Although this can be brought on by frequent substance use (expect for marijuana), neurogenesis also slows down naturally as you age.

But now there is hope, says the team from Brazil. A new understanding of how the brain reacts to CBD, along with other compounds in marijuana, “opens the door for their use to manage psychiatric symptoms in disorders such as ageing, stress and neuroinflammation.”

The study was led by Ismael Galve-Roperh of the Centro de Investigacion Biomedica en Red sobre Enfermedades Neurodegenerativas (CIBERNED), Instituto de Universitario de Investigacion en Neuroquimica (IUIN) and Instituto Ramon y Cajal de Investigacion Sanitaria (IRYCIS)
A marijuana high usually lasts two or three hours, during which a wide range of effects may occur, varying both in intensity and quality. The usual, most noticeable effect is intensification of sensation and increased clarity of perception. Visually, colors are brighter, scenes have more depth, patterns are more evident, and figure-ground relations both more distinct and more easily reversible. Other sense modalities do not have the variety of visual stimuli, but all seem to be intensified. Sounds become more distinct, with the user aware of sounds he otherwise might not have noticed. Music, recorded and live, is heard with increased fidelity and dimension, as though there were less distance between the source and the listener. Taste and smell are also enhanced under marijuana. The spice rack is a treasure of sensation, and food develops a rich variety of tastes.

Skin receptors are also effected. Heat, cold, and pressure receptors become more sensitive. Pain produces paradoxical effects. If attention is not on the area of pain, there is a reduced sensitivity to the hurt. But awareness of pain from a lesion, such as a burn or cut, will often persist for a longer period than usual, even allowing for the changed perception of time under marijuana.

Awareness of proprioceptive responses is enhanced. The person using marijuana may become aware of usually automatic, non-conscious, muscle tensions, small movements, feedback and control processes, and feelings of physical comfort and discomfort. These can be perceived with great clarity and distinctness.

Such effects vary with the individual and the situation. Sometimes one modality will predominate; sometimes a sequence of effects will occur; sometimes nothing will seem to happen. The direction or modality of effect can be often manipulated by the individual if he deliberately exposes himself to the stimulus, such as music, or paintings. However, such setting may not affect the perception if the person is not otherwise ready to respond in that way. Effects more often call attention to themselves; the user observes what he is experiencing in the situation and realizes it is not how he usually experiences the stimuli. On the other hand, some sense modalities may function in a straight pedestrian manner, neither being enhanced nor diminished.

The person himself is the most important determinant of how the enhancement will appear. Some persons orient primarily to visual stimuli and visual thinking, others to sound, others to tactile impressions. Visual orientation seems to predominate among persons in our culture; audile and tactile thinking is less common. It seems likely that sensory enhancement of a marijuana high would be most noticed in the predominate sense modality of the user; it certainly should have a differential response in relation to less used ways of perceiving.

Another factor which affects the response is that persons unfamiliar with the marijuana state frequently must "learn" that they are perceiving experience in a different way. That is, someone makes them aware of changed perception by showing them objects, playing music,
and calling their attention to the difference in sights and sounds. Then they become consciously aware of the perceptual changes. This initiation procedure has led sociologist H. S. Becker (Becker, 1963; partially reproduced in Solomon, 1966) to suggest that most of the effects of marijuana are learned, not spontaneous. He says (accurately, I am sure) that the user must learn to notice the effects, categorize them, and connect them to the total experience of using the drug. What is learned in most cases is not a new way of perceiving, but the awareness of a change in perception. Few persons observe what they are doing in the sense of observing their seeing, and it is not surprising that many should have to learn how to become aware of themselves experiencing by checking current perception against memory and expectations.

The user's internal psychological needs will also influence his response. A fear of being overwhelmed by too much input will often reduce any changes to only those which the user can cope with or to changes only in certain modes. A fear of losing control over the perception of experience may suppress most of the effects and even shut down responses to below normal. On the other hand, emotional involvement with some part of the environment may enhance its perception. Internal physical needs also affect the response, e.g., hunger may be intensified so the person finds himself ravenous on getting high.

For a person using marijuana for the first few times sensory changes occur sequentially, rather than all at once. First he may notice increased brightness and clarity of colors, then sounds, then visual structures, such as paintings or designs. (Two dimensional photographs and motion pictures may be seen in three dimensions in the marijuana high, a perception which can be transferred to the normal state under certain conditions.) Then proprioceptive sensations may present themselves. Any order of the effects may occur during one high state or several. Often effects will develop to particular levels and then stabilize without further elaboration. I know some individuals who listen to music during a high, and this is their major use and apparently their only enhancement.

There are two states of awareness which relate to these sensory effects. The basic one can be called pure awareness. In this state the person is completely and vividly aware of his experience, but there are no processes of thinking, manipulating, or interpreting going on. The sensations fill the person's attention, which is passive but absorbed in what is occurring, which is usually experienced as intense and immediate. Pure awareness is experiencing without associations to what is there.

The other state of awareness is one which can be termed conscious awareness, in which the sensory experience is connected to meanings, plans, functions, decisions, and possible actions. This is our normal way of perceiving and how we usually go about our daily lives. We do not sense the world directly, but with the incorporation of our memories, meanings, and uses. In the state of pure awareness objects are experienced as sensory qualities, without the intrusion of interpretation. There are examples of this in normal life. The sensation of sexual orgasm may be (and hopefully is) experienced with pure awareness. Natural beauty, such as flowers, mountains, oceans, and sunsets, is sometimes experienced from a point of awareness without adding conscious thinking.
These two processes of awareness have been described by Charles Solley and Gardner Murphy (1960, Chapter 14) as non-reflective consciousness and reflective consciousness. Alan Watts compares the awareness state to a floodlight of attention, which shows a broad area and lights up anything that is there. Consciousness awareness he compares to a spotlight, which is focused and can be directed, though on a narrower area. This is a good analogy in pointing out that no deliberate directing is done in the awareness state, although it is sometimes the case that the area perceived in awareness may be a small one seen in great detail.

The awareness state can be called "choiceless" because choice is a part of consciousness functions. Decisions made outside of consciousness are not called "by choice" since choice implies conscious action. In a state of direct awareness there are no choices made and no decisions or actions occur. The stream of sensation flows and the person is aware of what is happening; if he acts he does so without consciously deciding to move. (That is, action is handled by some process other than the consciousness monitoring the awareness experience.) When complicated action becomes necessary conscious attention is activated and the sensation is used as stimuli, criteria, or information for the choices, plans, or action.

The awareness is not always experienced purely under marijuana, but often is mixed with some, though reduced, conscious attention. Consciousness, conscious awareness, or conscious attention involves a connecting function which observes experience in relation to past experience, memory images, memory recording, expectancies, plans, goals, etc. This type of consciousness may intrude on the awareness state at a low level. However, when awareness fills the attention there is a "becoming lost" in the experience, in which there is often not even a memory of what occurred. This seems to be a state in which consciousness functions are not present, and all experience is at the level of awareness. Consciousness, attention, and memory recording are apparently not active. (It is possible that attention was present and either was not remembered or the memory is not accessible to consciousness.) Such a state of pure awareness is at one end of a continuum of varying degrees of conscious activity, with the other end at a state in which the contents of awareness are used for decisions, plans, inferences, etc., and are not experienced for their primary sensory qualities; they are information rather than experiences.

This analysis suggests a reason for sensory enhancement under marijuana, a movement of attention from consciousness processes to awareness processes. We usually think of attention as synonymous with consciousness, but it is an uneasy synonymy. Consciousness seems to be more than attention, but we cannot describe a consciousness without attention. Perhaps it is possible for attention energy to move into sensory processes and operate less in the decisional, deliberative processes of consciousness. If this happens it would provide much more energy for attending to sense data, and we could expect the sensory experience to be more vivid and more detailed.

Intensity of sensory experience seems related to the total proportion or amount of attention which is involved in the process. If attention is used in conscious or unconscious processes in making decisions, remembering, evaluating, etc., then this much is removed from the awareness of the sense experience. Thus it may be that one of the causes of sensory experiences...
enhancement under marijuana is that attention energy moves from consciousness processes into awareness processes, which amplifies the experience.

**TIME DISTORTION**

Besides sensory enhancement, the other most immediate effect of marijuana is a change in the perception of time: events take longer to occur. Bach's first Brandenburg Concerto lasts hours. An hour seems to have passed, but the dock records 25 minutes. The person's internal fantasies are long and involved, but only a few minutes have passed in government time. In this state the fantasies and music do not move at a faster pace---they move at their own usual rate, though often more fluently and more dearly. The impression is that external time must have slowed down, while the internal experience continues at the same rate. There is not the impression of speed or rapidity, but that the time available to the user is magnified.

There are similar effects in normal experience. Time spent at a boring talk seems to pass more slowly, and one thinks in dismay, "What, only five minutes have passed since I looked at my watch?"

A method used by Linn Cooper (1956) to induce time distortion under hypnosis is useful to note here. A metronome set at one beat per second is used. The hypnotized subject is told that the metronome is slowing down to one beat every two seconds, every five seconds, once a minute. Verbally or conceptually we can now say that the subject's internal rate has remained the same, but external time relative to the subject has slowed down. Has the subject's own pace actually speeded up? I do not know, and I can think of no reliable criteria for determining this. Brain wave research shows that the basic alpha rhythm can be speeded up by a flickering light (called photic driving), but not very much, and not even to twice its normal rhythm. Cooper's subjects report that they do mentally imagine the amount of thoughts appropriate to the expanded time available, including counting imagined objects. This may be a convenient hallucination or it may be an accurate description of what they do. (Even calculation of real problems would not be a valid test because calculating geniuses can answer complex mathematical problems almost instantaneously, and this ability may be available under hypnosis, though it has never been reported to my knowledge under marijuana or hypnosis.) In this procedure under hypnosis and also in marijuana the subjective experience of time is disconnected from the marking of social or government time.

The effect under marijuana is analogous to effects in visual and sound modalities. Visual scenes often have more depth, sounds are heard with more dimension; so too with time—there is an expansion of the fabric of time so there is a feeling of depth instead of the usual two dimensional flow.

The explanation of this sometimes given by marijuana users is that more is happening: they are thinking faster or more thoughts are occurring in the same time period. This could cause external time to be relatively slower. Although it need not be the case that internal processes change at a faster rate it is possible that a person is aware of more perceptions in a given amount of time as a result of the enhancement of sensory data. With visual enhancement more details of the movements of the self and others are attended to. This means that more
information is perceived in the same amount of time. This is also true of proprioceptive and tactile responses. Time is somewhat conditioned to a normal rate of information input in particular contexts. One has a "standard rate of intake" and if the amount of information is increased for a unit of time, then one of the responses may be that time is going slower. To be conscious of any change in experience there must be a comparison with previous similar situations. Thus if the time experience while high is compared with a similar normal experience, or with a time pace constructed from normal experience, it may be perceived as slower.

A more important cause for time distortion under marijuana can be found by noting how persons normally judge the passage of time, then investigating the changes in these criteria caused by marijuana. This is rather difficult because no one knows how we judge time. Nevertheless there are some relevant observations which can be made.(1)

Notice the situations in which time seems to alter for many persons in everyday experience and out-of-the-ordinary experience. These are situations in which the experience itself is the focus of attention, they are not means to extrinsic goals. Persons totally involved in making love seem to have no awareness of how much time may pass. Persons in a state of anger do not become aware of time lapse until the emotion subsides or ego controls are invoked. Psychotherapy hours in which emotional material is covered seem to be out of time awareness. Mystics become unaware of the passage of time during meditation, as do persons having peak experiences (Maslow, 1964). In dreams, daydreams, fantasies, ecstasy, and strong emotional states, the sense of time is absent or changed. And in the state of pure awareness, as I have used the term, there is no perception of the rate of time. These are all personal experiences in which conscious attention is not dominant, and immediate experience, rather than goals, expectancies, plans, and decisions, is predominant. Time perception is a socially reinforced response. The experiences and states I have described are not states which are socially conscious; they are not internally subordinated to social time or schedules. Anger cannot be paced with conscious control, nor can ecstasy. Feelings, fantasies, dreams, and awareness do not incorporate the sense of time which is built up by and maintained in the consciousness. Thus when one is experiencing such content there is no marking of the passage of time, and to the extent this material is the content of awareness, the less social time is noted. Immediate experience is always timeless; time is perceived in relation to the uses of experience in controlling or predicting the future or interpreting the past, the present being perceived in relation to past or future. This is one of the major functions of consciousness. In a normal conscious state when the internal or external input is to be changed or manipulated the time required is automatically projected, based on past experience. This imposes the knowledge of time on the consciousness. One of the effects of marijuana is to reduce the strength of expectancies and goals which are socially reinforced. Thus non-time experiences are increased in relative strength and time oriented associations are decreased, which creates the sense that time is expanded.

Some indication that this is what occurs may be seen in reports of marijuana users that time passes instantaneously. One girl reported that when high she suddenly discovered 45 minutes had passed without her realization of this. And there are reports of listening to music when the individual realizes the music had stopped, without his remembering hearing the selection as it
Marijuana and the Brain

was playing. What happens in these cases is that most of the person’s attention is in non-time processes, so that time passage is not noted until the social consciousness returns. Then it seems that no time has passed, since there was no process noting its passage. Just as in sleep, amnesic hypnosis, or anaesthesia, there is no consciousness of the duration of the state, and the conscious time flow seems unbroken from the moment of falling asleep to the moment of waking.

When observing sensory stimuli, listening to music, fantasizing, etc., there is the feeling of expanded time because the outside experiences are overwhelmed by the mental, internal experience which is not marking time and there is no way to gauge their pace. The quantity of the time change varies. If the user is almost totally involved with the awareness processes, with little conscious attention, then there will be little sense of duration, and long periods of clock time will go by quickly.

Events themselves are timeless, in that they are always in the present—they do not echo their past nor presage their future states; we alone do that to them, for ourselves. And we ourselves do not experience the past or the future; we experience memories or expectancies, which may be realistic or fantasies. So our experience of the passage of time is based on our comparison of present experience with our remembrance of the past, usually the immediate past, or our anticipation of the future and how we get there.

Marijuana decreases the strength of the automatic memory, expectancy, and anticipation processes; thus the perception of an experience is not surrounded by the usual multitude of past encounters, future possibilities, and potential uses. In contexts requiring action on the basis of expectations and plans, such as driving an automobile, they are available and often with more focused attention. Given a situation not requiring activity or decisions, the penumbra of response patterns, functions, and potentials surrounding experience decreases, and the immediate experience per se is perceived, rather than its position in a pattern of change. This decreases comparison of the present with the past, and again reduces the feeling of duration or passing of time. ("Passing of time" is a curious phrase, because time passing cannot be empirically observed. One may conclude the passage of time by observing changes in experience, but it is not really an inference either. What seems to be described is the mental reviewing of the preceding changes which led up to the present point. Re-running the succession in memory from some point up to the present gives the sensation of passing time. We are aware of events which are different from the ones we now experience but that are connected by physical changes in which we have participated (directly or through observation). This awareness may be "awareness of the passage of time."

In summary, under marijuana, the sense of time is distorted. First, because mental contents and awareness processes which are not connected to time needs or markers are strengthened. These include daydreams, fantasies, event memories, peak experiences, emotions, and the pure awareness state. Second, because goals, anticipations, and expectancies are decreased in prominence, reducing attention given to possible changes in the environment, which decreases awareness of future states. Third, memory of immediate past experience is decreased in strength, which reduces knowledge of change and moves attention to the present. If consciousness is completely passive, and non-time elements fill attention, then the experience
Marijuana and the Brain

seems timeless. If some consciousness processes and associations are maintained time will seem to have slowed, as attention moves among the various contents.

EXPECTANCIES

Both the intensification of sensory experience and the expansion of time are part of an increased attentiveness to immediate experience in contrast to memories of the past or plans for the future. Memories and plans are experienced but only as they arise out of the immediate content and needs of the person's internal and external experience; they do not automatically operate as in normal consciousness. Every action and potential action, in the normal state, is evaluated according to its consequences: what results will follow. Mental processes imagine as many consequences as they have experience to do so, both immediate and long range, testing these consequences against criteria or goals of valued states. The consequences which are most valued control the action. For example, if a person feels angry toward another he may want to insult him verbally. He mentally anticipates the possible consequences of this action, which may include the release and satisfaction of the anger, feelings of masculinity, enhanced self concept of strength, etc., on the positive side, and the anger or disapproval of the other person, loss of self control, fear of his own impulses, what his mother would think of the action, etc. on the negative side. Depending on the person's past experience, his needs and strengths of various values, the action will be taken, modified, or inhibited. Every action a person engages in is surrounded and extended mentally (consciously and unconsciously) by such expectancies, and every situation experienced by a person is responded to by anticipating its potential consequences and relating them to desirable and undesirable conditions. (Of course, the opposite of such action---its inhibition---is also subject to the same processes.) Some of this process is conscious, especially when the situation is new, unfamiliar, very important, or ambiguous, but most of the expectancy and anticipation process is done preconsciously. Normally persons are not aware of the activity which occurs to determine an action; expectancies have become incorporated into automatic responses.

The mind is efficient in making its activities automatic. First an action is consciously made in response to a need or situation. If it is successful (reinforced) it becomes habitual, and is taken automatically without the need of conscious attention, much as driving a car, sewing, tying your shoes, and smoking a cigarette are all composed of large blocks of now automatic actions which once had to be done with conscious attention at every point. Later only the major elements must be controlled with conscious attention, such as changing lanes when driving, searching for an ashtray, etc. How can an action be released without conscious attention? What must happen is that criteria for action and the particular action are connected by the conscious mind; then the process can be made automatically. When the criteria are fulfilled, then the action is made. (2) This suggests that there is some process or energy which releases action but which does not need conscious attention. Similarly, most of the expectancies around experiences are not conscious---only the more important ones or ones which are so complex as not to be automatically used.

Such expectancies and anticipations function to keep behavior consistent, goal directed, and reasonably integrated. They help avoid conflicts within the personality and with the environment, including other persons. They have obvious survival value and undoubtedly are
reinforced by our society and our own needs. The function of reinforcement is clear: The reinforcement value of the projected consequences of an action come to affect our decision to take or not to take the action. These expectancies are responses to possible futures, and orient our actions to the future] not the present.

One of the major effects of marijuana is to decrease the strength of these expectancies and anticipations, on both conscious and preconscious levels. Thus in the high state the expectancy processes decrease their influence on behavior. Since these are always oriented to future states, they take attention away from perception of immediate experience and turn it to following imagined states. Thus when attention given to imagined states is reduced, the perception of the present experience will increase in strength or intensity, either because more energy is available for such awareness or because there are fewer processes to attend to, and present experience becomes relatively more predominant in the mental field. This enhancement of immediate experience is reflected in the effects of marijuana on sense data and time perception. Indeed, the decrease in expectancies, which are connected to goals, may be one of the reasons for the change in the awareness of time, since time is perceived in terms of changes, including changes in relation to a potential state of affairs. If the knowledge provided by expectancies is reduced, then the immediate experience will not be seen as a point in time with a future, but more as an event, *per se*.

The reduction in the strength of expectancies also contributes to the increase in intensity of sensory experience. Objects as well as situations and actions are surrounded by our potential responses to them, such as our past experiences with them, how we might use them, other forms they have taken, how they are made, their qualities in other sense modalities, etc. When we perceive an object, whether a fire in a fireplace, a photograph of a fire, a fire engine, or a fiery speaker, not only are we aware of the object, but also we have incorporated in our awareness these other elements which give structure and meaning to the sense data. Thus we know that the object is a bird cage or a rib cage, and we know its qualities, functions, and potentials. Usually these are keyed to our verbal response, our classification, but they are known non-verbally as well (e.g., we can have emotional responses or motor responses without verbal responses).

**FUNCTIONAL ASSOCIATIONS**

Particularly important to us is the function of objects. (3) One sees this in a child's definition: a hole is to dig. A bridge is to walk over to get to the other side. Someone said that home is "A place where when you go there, they have to take you in." There is an essential effect of these operational definitions: they force classifications rather than specificity. Any hole is to dig and how hole X differs from hole Y is not important so long as each can be dug. My home is not different from your home, since they will both take us in. Such definitions attempt to capture some particular criteria of whatever they define. The criteria of definition are the only characteristics which need to be observed in perceiving the object, and we are trained to perceive in this way. We learn as children to see the function of objects and to see the similarities of objects, rather than experience them in all possible ways. The advantage of this is obvious: we survive because we can use the environment, we can generalize, we can cooperate within a socially constructed reality. The disadvantages are obvious: we may not see
reality except in terms of functions, which shuts out an enormous amount of reality (some of which would be functional in various contexts). And often persons see objects only in terms of their own functional needs, which narrows their perspective considerably. (Psychologists might see persons as experimental subjects, an insurance salesman might see one as a prospect, etc.)

This leads, incidentally, to failures of discrimination in perception, illustrated by the classical occidental observation that all Chinese look alike, and no doubt Chinese observe the same about occidentals. One of my friends took an astronomy course and discovered that stars were not all the same color, as he had previously perceived, but were red, blue, yellow, and white. This led him to realize that all trees looked alike to him. Of course he would not have said that they were identical, but I doubt if he could have told the differences between an elm and an oak, even standing in front of them, because a tree is with leaves and to be shaded by. And after all, which of us could easily describe essential differences between two holes dug by a child in the sand at the beach? Though the child probably could.

Under marijuana the functional associations of objects are decreased in strength. In addition to this specific association, other associations such as verbal labeling and memory constructs of such objects are decreased in strength. Normally all these elements are imposed on the conscious experience of the object, some incorporated into the perception (such as seeing the object as a teapot) and some claiming attention on the periphery of consciousness (such as knowing it is hot and not touching it). When these associations are decreased there are fewer mental impositions on the sensory perception of the object. Aspects which would normally be shut out (such as a blemish on the teapot or the shape of the handle) are given equal attention, and hence are seen instead of being ignored. When attention is directed by goals, as it usually is in the normal state, it is simply not given to non-functional stimuli, i.e., elements that do not have anything to do with what the person wants at the moment.

The person under marijuana is not seeing this object as "flowers" with a mental image of flowers and his memories of flowers being confirmed by these flowers, which are to look at and smell and if one can look at and smell these one has confirmed that they are flowers and that settles that part of reality, and so on to another. Rather he has a great deal of time and it is not urgent what uses these have or what consequences could result and much more of his awareness is filled by these flowers. And there are textures, colors, shades, shapes, feels, crevices, shadows, smells; all things that are there; experienced rather than used.

An important principle is that you can experience something only if you do not think in terms of its function. You can know what it is only if you do not impose what it will be or could be or ought to be. This often becomes quite evident under marijuana.

This suggests a principle regarding processes of attention. When attention is reduced for some elements in perception, the amount given to other elements increases, as though attention is a mobile amount of energy, and when a quantity is not needed at one point it moves to another point. This is consistent with Freudian theory, which holds that as energy is released from conflict points it becomes available to the general system. With marijuana, when association processes reduce their demands on attention, it flows to whatever else is in the consciousness.
Marijuana and the Brain

(I am using a fluid metaphor, but other models will do equally well. Electrically one can speak in terms of activation. Cybernetically we could refer to homeostatic balancing of elements. Or we could talk of homunculi leaving the study and going to the patio.)

ASSOCIATIONS

This reduction of associations is an important basic effect of marijuana. It contributes to the expansion of time, to sensory enhancement, and to the increase in attention which is given to the focus of consciousness. However, not all association patterns are decreased in strength in the high state. Well known are the flights of fantasy and dreaming stimulated by hashish and cannabis. And in non-fantasy high states users have reported that they can perceive connections and associations of ideas that were not accessible to them in the non-high state (usually called "straight" by users). This seems inconsistent with what I have just said about the decrease in association strength. However, while associations, particularly those based on social learning, are reduced in strength, any association may gain in strength if it becomes the focus of the detailed attention possible under marijuana. Thus fantasies and creative thinking may have increased associations and may be more fully developed than in the normal state of consciousness.

The associations which are reduced in strength seem to be those which are learned through social reinforcement: meanings and behaviors which are taught by society. Functions of objects are socially taught. Patterns of communication are social. Language and verbal knowledge (Columbus discovered America in 1492) is social in origin. Inhibitions and controls on behavior are socially reinforced, and are often incorporated into the verbal system through "should" and "should not" statements. When social norms are the same as personal needs, desires, and meanings, there is consistency in the response to a situation or object. When conflict between social and personal directions occurs it must be resolved, and usually it is resolved in favor of social meanings, functions, and approved behavior (usually called rational). Thus the social perception of a situation may exclude many of the potential meanings, behaviors, and emotions. Under marijuana this excluding function of socially learned associations is reduced in strength. The excluding function has certain survival value. It keeps our consciousness from being dogged up with unnecessary and distracting contents. Thus a scholar looks at a book and notices the title but not the binding: for a book binder the opposite is the case. Associations which contribute to the goals of society are learned by persons through social reinforcement, and one effect of these associations is to inhibit other associations. Marijuana decreases this inhibition and lowers the reinforcement value of the association. In effect this makes all associations more equal, and the network of associations is less guided or channeled in socially reinforced directions. A person who is high may be aware that an object is a pencil, but he may successively also see it as a shape, a phallic metaphor, a geometrical solid, the printing on it, etc. He has more associations once they are away from the strict control of social perception.

INHIBITIONS

The same pattern can be seen in expectancies and anticipations. Socially oriented behavior makes great use of expectancies to control behavior in an effort to maximize approval and
minimize or avoid disapproval, which are social reinforcers. Such behavior thus involves a large amount of inhibition. By inhibition I mean any kind of control to prevent activity from reaching a certain level. The activity can be thoughts, action, fantasies, or emotions. Inhibitions in Freudian terms are controlled by anti-cathexes, in learning theory by aversive stimuli, and in terms used here, by expectations of aversive stimuli. Inhibitions need not be on anti-social acts, but are often to direct behavior into patterns normal in our society. Persons maintain appropriate social distances (which are arbitrary), you do not tug at the beard of someone you have just met (though the thought may cross your mind), and a man does not cry in public. These may seem minor but they are controlled with great power by social reinforcement, as can be seen by the strong rejection of the behavior if it occurs. Of course, inhibitions are also placed on behavior which would be dangerous to society, such as aggressive or destructive acts.

When behavior is inhibited, the psychological tendency is to inhibit any mental activity which might lead to such behavior. Feelings, impulses, images, fantasies, etc., may be inhibited and decreased in strength, or even prevented from entering consciousness. Such inhibited feelings and impulses may appear in consciousness in the high state, often without effort of the person. This may cause anxiety and the person may use ego defense measures to block their appearance or diminish their threat. On the other hand, he can also use methods of analysis and self-therapy in the high state to deal with conflict material, and may free himself from neurotic responses.

The effects of the reduction of social inhibitions can be seen in various ways. At marijuana social gatherings persons may not feel pressure to participate in conversational games, play behavior increases, physical activity may increase. The decrease of socially reinforced inhibitions also accounts for the actions of users which claim public attention: jumping over fireplugs and parking meters, uninhibited dancing (erotic and non-erotic), and playful behavior (which is subtly taboo in our society). Here the person is expressing impulses in behavior which would usually be inhibited by expectancy of negative social reinforcement (frowns, rejection, blame, punishment and other expressions of disapproval). However, this reduction in strength of social inhibitions does not usually result in anti-social acts (unless jumping fireplugs is considered anti-social). This is curious because social inhibitions are usually considered the bulwark against committing crimes, aggressing against others, raping women, etc. But we do not have cases of contemporary users of marijuana burglarizing or attacking others, though such effects are evident in the use of alcohol, where users are much more likely to express violent and aggressive behavior.

Why then if inhibitions are reduced in strength do not users become violent and aggressive? One reason may be that aggression is usually specific to situations and expectancies about situations, and the use of marijuana today rarely is in a conflict situation. With reduced pressure from memories and expectancies one would also expect less non-relevant feeling. Beyond this, one of the psychological effects of marijuana is euphoria. Thus anger and aggressive impulses are less strong and do not draw much support from the rest of the personality. This effect may also be related to the decrease in the strength of social reinforcers,
since chronic anger is often the result of conflicts between social requirements and personal desires.

**ATTENTION**

The process of attention is clearly affected by marijuana. The most obvious effect is to narrow the amount of diverse contents in the focus of attention. The person under marijuana usually perceives fewer objects of attention, which may mean physical objects, actions, social elements, emotions, etc. We have already noted this effect: a person who is high may become absorbed in an object, event, or process to the exclusion of everything else. A train of fantasy may occupy all of a person's attention. This is a psychological analogy of tunnel vision, with the contents of the tunnel expanded.

In the normal, straight state, conscious and non-conscious processes give continual attentiveness to many internal and external stimuli, with responses such as awareness, memories, expectancies, and the many associations we have already noted. Many of these are conscious, especially those on which decisions are necessary. Others, and probably the bulk of the responses, autonomously operate without being consciously attended to, and come to consciousness only when necessary. These are in a preconscious state, but nevertheless involve perception, associations, memories, and expectancies.(6) Such processes often regulate behavior when consciousness does not intervene (as in driving a car automatically). But whenever novel stimuli appear or more than routine decisions must be made, the contents become part of the conscious state.

In the consciousness processes connections can be made among several types of information, and in different contexts of meaning---making connections with the many factors relevant to a decision or the resolution of conflict.. Conscious attention moves easily from one interpretation to another interpretation of information, with the various memories and expectancies which go with each interpretation, thus obtaining more information for the decision. These interpretations and associations are drawn from the preconscious processes, which, alone, cannot make interconnections among themselves as fluidly as can consciousness. Connections of ideas are made in preconscious states, but these seem based on almost any relation, from contiguity to puns. Consciousness can select the significant or realistic connections and systematize their use.

We can regard the conscious system as the system which does just that: selects and interprets information in relation to a goal or purpose. It does this when it is activated by attention energy. It may be that attention is the activating energy of awareness. Attention usually is in the conscious system, which consists of processes which select information to make decisions. It can also be activated in preconscious contents, which contain information, emotional values, and random associations. Most of the time awareness is of the conscious processes.

Under marijuana attention-awareness energy may move into the preconscious system and be less in consciousness processes. Since there are fewer elements in attention the person is more
Marijuana and the Brain

strongly aware of any individual element of meaning, memory, emotion, etc., and less of its relation to other elements which would be relevant in the conscious system. Whatever is in the center of attention occupies all of awareness: this may be sensory data, such as visual stimuli, or imagery, such as fantasies. The effect can be termed a unity of attention, in that all attention is focused on one subject. In normal conscious states, several channels can be used at once, e.g., reading a book while listening to music. Attention may alternate, but even so keeps all channels of input on the edge of attention. This does not occur with marijuana, which so far as awareness goes, fills the attention with one thing at a time. If one is recalling an experience from the memory, then almost all attention is on the event, and almost none on the external environment, expectancies or plans. Processes in normal states which seem to parallel this would be extreme concentration on a book or television, exciting conversations, and the state of romantic love.

It is not the case that there is less attention, for the quantity seems at least the same. Analogically it is as though a portion of a photograph were blown up to the size of the original picture, thus maintaining the size of the print but increasing the magnification of a smaller relative section.

Some of the processes which contribute to this effect are obvious. The reduction in expectancies and associations reduces peripheral contents of consciousness. Many of these elements are maintained continuously at a low level, appropriate to the environment and needs of the person. Some items are continuously monitored, much as a hostess may habitually check how each of her guests is getting along. Such monitoring takes some attention away from any central content, just as the hostess may not concentrate fully on her own conversation if she is attending to the state of her party. However, without the need for these side glances, attention flows to the central subject. This means that the plans, anticipations, etc., are not automatically attended to, although if such an element enters the central position it receives the intense central attention and is attended to in great detail.

Peripheral attention and its contents are reduced in the high state; central attention receives the energy which would otherwise be used in peripheral attention. This could be because each type of attention is different, and thus differentially affected, or because the peripheral contents are reduced in strength because of the reduction in the strength of associations. The latter seems to be true; the former may be also.

MEMORY

One of the processes important in perception is the comparing of current input with similar past experience. When we see a friend, a memory image of his face is presented to our consciousness along with the sensation of his actual present appearance. This memory image (which can be called a schema) blends with the current sensation, so that the perception is a combination of the two. The relative strengths of each source of information probably vary from person to person. Some primarily perceive the memory image, with the sensory input serving as confirmation of the identification. For others, the memory image may be so weak that reorientation and identification is continually necessary. Though the construction and
recall of this image is not clearly understood, it must be partially constructed from previous experience of the stimulus (including verbal knowledge) up to a point where the person knows all he needs to know for purposes of his response. After this, encounters with the stimulus do not add to the memory image appreciably; further discrimination is unnecessary and the image stabilizes. (Of course, the person may continue to make discriminations. One of the valued behaviors in science is to make perceptual discriminations for which we have no functional need, assuming that such information is valuable per se or may be valuable later.)

Most persons rely principally on memory images in perception unless there are evident differences in the immediate situation, and their responses are keyed to the memory image. Consequently we do not respond only to immediate experience. We identify current experience according to past experience and then respond on the basis of past experience, modified by whatever differences we perceive to be significant in the current information. Our actions originate from past experience, they are connected to the structures built up in our memories, and these memories are elicited by the immediate stimulus. In unfamiliar settings, no memory image is available. Then we must deliberately and consciously act, randomly act, follow instructions or models, or act according to the most similar memory image. Any situation is a combination of elements, and may call for complex combinations of memories and response patterns, some new, some familiar.

Marijuana has two effects on this process. The first is to reduce the general automatic availability of memory images; the second is to increase the strength of memories when they are relevant to central needs. We have already discussed the general reduction in strength of memories in response to current experience, which is principally in the automatic recall of memory schema. The strength or visibility of the mental image is reduced, with a resulting increase in the brightness of the data themselves (there being nothing else to look at). This explains also why experiences seem new: they are observed without the feeling of familiarity caused by memory images. For most persons in straight consciousness it is likely that sensation is checked against a memory image (at a preconscious level) and what is seen from the current stimulus is what is necessary to fulfill the criteria for identification, based on the memory schema. The relevant elements, the criteria, are affected by the goals or functions which are important to the person. We do not perceive dust on a typewriter when we look for something to type on. When we look for a friend in a crowd we do not look at his face, we identify it. Similarly, in conversation and daily life we generally know what we are seeing, so perception is more identification than observation. However, when fewer memory images are available, as when high, one must respond to the sense data as unfamiliar material. This may cause anxiety, depending on the individual and the environment, or it may result in pleasure at the enhancement or challenge of current perception. It may also increase the potential responses, since there is less pressure for a learned habitual response, which would normally inhibit other responses.

(This may, incidentally, suggest an explanation for the jamais vu sensation, in which there is the feeling that a normally familiar situation is totally unfamiliar. Several experiences of jamais vu reported to me seem to have occurred when there are unfamiliar emotional
elements present, as though the usual memory schema and their associated responses were not available.)

At the same time, some memory images may be strengthened if they are emotionally salient. A person having paranoid fears, for example, may find his imagery increased in strength. One person reports that once when high he observed a friend sitting to one side of him staring directly at him. He turned to face his friend and found him looking in another direction, his face turned partially away from him. Apparently a fear activated the image of a full staring face, which was superimposed on the profile of the other person. It may be that psychotic or schizophrenic perceptual projections are partially caused by increased internal imagery. Under marijuana, at least, emotional force may activate internal imagery which is used to search for, identify, or interpret incoming stimuli.

So also if the person deliberately attempts to recall past experiences there will often be increased recall, either of events in great detail or Hashes of experiences. This is particularly true if there is salient emotional content. Recall which appears to be eidetic may occur under marijuana, and images which are like playbacks of the original perceptual experience may become accessible at will to conscious attention. If the conscious attention is allowed to unfocus, so that only monitoring is going on, almost instantaneous images can be obtained of visual and sometimes auditory or tactile stimuli. The image must be seen when it occurs; if there is an attempt to hold it in consciousness a mental composite image takes its place. It is possible that what occurs is an activation of the actual memory record, selected from the stream of consciousness which is recorded in the brain.(7) Only one flash comes at a time. This ability, incidentally, has been transferred to straight, non-high control after it has been observed under marijuana. The essential feature seems to be in allowing the conscious attention not to try to hold on to the image when it appears. One must learn to see rather than look.

Another type of memory which is strengthened is that for emotion-laden events. Strong emotional responses, such as grief, fear, guilt, etc., often arise under marijuana. These are responses to remembered events, responses which might normally be suppressed. Usually the person's sense of identity is functioning, so he can either accept the emotion and be a part of it, which is usually therapeutic, or reject it, which may produce dissonance and anxiety. "Bad trips" are sometimes caused by emotions or pressures which threaten the person’s self concept or his sense of control. While suppression processes are usually not too effective as defenses, distraction is, because of the mobile flow of attention under marijuana. For this reason, movement such as dancing, running, exercise, showers, etc., will usually change the emotional tone.

One other effect on memory should be noted. Normally we have a short-term recall process which holds memories in access for about 20 minutes, and then a long-term storage, which is permanent. In the high state, short-term memory becomes shorter, and in very high states the sequence of thoughts is not remembered past one or two transitions. The sequence can sometimes be recalled with an effort, or reconstructed, but there is no automatic remembering
as there is normally. On the other hand, after the high, events within it can be remembered, indicating that at least some of the experiences are being filed in long-term memory.

Partly due to the reduction in strength of memory there is less intellectual control over the stream of consciousness. Memory seems to be needed to maintain concepts or goals under which to manipulate thoughts. Another cause of the reduced control is the lowered inhibition processes, which are used in thinking to filter irrelevant material and keep it from cluttering the conscious attention. Logical ideas and connections may also be enforced by such inhibitions; these would be loosened by the decrease in association strength.

**VARIABLES**

In general for marijuana to have effects the user must cooperate with it and facilitate the effects. He must learn to allow himself to respond. There are some persons whose response to marijuana is almost unnoticeable; their consciousness seems not to change. These may be persons who have fears about and strong defenses against losing control, and elements of their feeling, thoughts, or action which threaten their control are strongly rejected. Such personality systems are endangered by marijuana effects and often maintain their structure against these effects. Sometimes they will respond, but what effects are occurring will be blocked from their conscious awareness. The most noticeable effect is often time distortion, indicated by long silences and broken often by a comment that nothing is happening.

The effect of the physical and interpersonal setting on the response to marijuana is strong and usually controls the tone of the experience. The basic fact is that the individual creates the reaction, not the drug. If the person feels under pressure, then the drug will enhance his feeling of stress, and the effect will depend on how the person can deal with the stimulus. If he feels energetic, the drug will enhance his willingness to be active. Some persons become less self-conscious, others more self-conscious. Some move physically, others sit quietly. Some talk, others are silent. Users of marijuana are as individual as they are. For this reason, one must expect different effects to occur from different times and varying physical and interpersonal surroundings. For some the effect is quite different when smoked alone than with other persons, probably because social situations elicit different personality elements and present various pressures.

These variable factors should be noted in considering research and investigation of the effects of marijuana. The plant probably does everything anybody has claimed for it, but only in a situation which enables it to do whatever is claimed for it. One highly respectable philosopher and author, who has explored a variety of chemicals, says that marijuana will take a person as far as LSD. To which I would add, especially if you can go as far as LSD on it. This is not tautologous, for it cannot be said of coffee or orange juice; even if you are ready, coffee will not take you there.

There are further effects of marijuana which relate to complex structures of association, learning, values, intra-personality communication, interpersonal perception, and consciousness. It is difficult to separate the awareness of these effects from the effects of the
Marijuana and the Brain

awareness. It seems best to stop at this point, having discussed what seems verbalizable at present.

Given facilitating conditions, the effects I have described will develop. Sensations are enhanced and clarified: sight, hearing, taste, touch. Time perception changes. Attention becomes more unified, and moves more into preconscious material and the state of pure awareness. The many broad processes of association, such as social meanings, memory images, expectancies, and plans are reduced in number and relevance. Inhibitions and suppressions relax, allowing emotions, thoughts, fantasies, and memories to flow more freely. The development and strength of these effects will depend on the individual, the times he has used marijuana, how he has used marijuana, and the environment.

(1) See "Time and the Unconscious" by Marie Bonaparte (1940) for speculation on this problem from the framework of psychoanalysis.

(2) This is the behavior structure described insightfully in Plans and the Structure of Behavior, by George Miller, Eugene Galanter, and Karl Pribram (1960).

(3) An excellent discussion of this and other relations of language to perception is in Semantics and Communication, by John C. Condon (1966, Chapter 3).

(4) Accounts of such experiences can be found in The Drug Experience (Ebin, 61).

(5) Julian B. Rotter (1955) discusses this process in "The Role of the Psychological Situation in Determining the Direction of Human Behavior."

(6) By preconscious processes, I mean a state of mental functioning which goes on outside of conscious attention. Lawrence Kubie describes this foggy territory in Neurotic Distortion of the Creative Process (1961).

(7) This kind of recall can be obtained by electrical stimulation of the brain. See Wilder Penfield and Larnar Roberts' book Speech and Brain Mechanisms (1959), Chapter 3.

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In Fifth Grade we were all taught our bodies are made of Atoms. Atoms have Electrons in their outer Shells. Electrons Repel, thus no Atom can Touch any other Atom. You cannot Touch the Chair you are sitting on. A Human body will have over 10 to the 27th electrons. This is more than the number of grains of sand on the Earth TIMES the number of visible Stars in the Sky.

No Human being has ever been able to Directly Perceive our True Energetic Nature. So any Human Conceived Philosophy or Perception is flawed. Our senses can be lied to. Our Perception can be Twisted by Motivation. Our Income can Influence Ideas. As We Think, We Are. The Powers of the Mind are Infinite. We can Expand our Consciousness by Reducing the Judgements and in Accepting the Impermanence + Pliability of Philosophies.

Marijuana is not addictive, does not make major disease, it does not cause cancer.

----BUT-----

It has one serious negative side effect it Erodes Motivation

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