


The Human Animal



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Drugs of Plant Origin



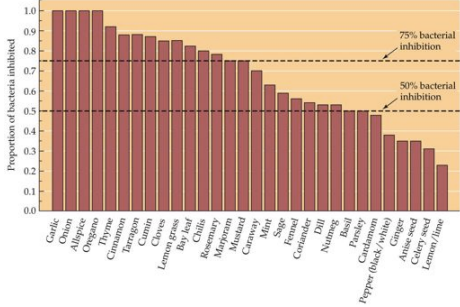
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Plant Secondary Compounds



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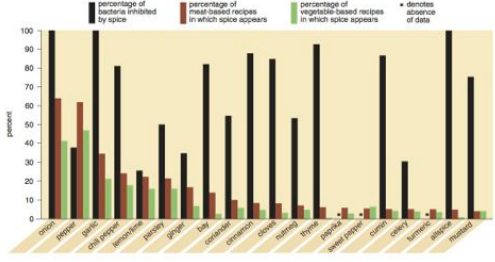
The Spice of Life



Spice	Proportion of bacteria inhibited
Garlic	0.98
Onion	0.98
White pepper	0.98
Black pepper	0.98
Thyme	0.95
Curry	0.92
Turmeric	0.90
Vanilla	0.88
Cumin	0.85
Coriander	0.82
Bay leaf	0.80
Chili	0.78
Rosemary	0.75
Sage	0.72
Mustard	0.70
Chives	0.68
Spinach	0.65
Fennel	0.62
Cardamom	0.60
Dill	0.58
Nutmeg	0.55
Pepper (black/white)	0.52
Mustard	0.50
Cardamom	0.48
Vanilla	0.45
Chili	0.42
Mustard	0.40
Chili	0.38
Mustard	0.35
Mustard	0.32
Mustard	0.30
Mustard	0.28
Mustard	0.25
Mustard	0.22
Mustard	0.20
Mustard	0.18
Mustard	0.15
Mustard	0.12
Mustard	0.10
Mustard	0.08
Mustard	0.05
Mustard	0.02
Mustard	0.00

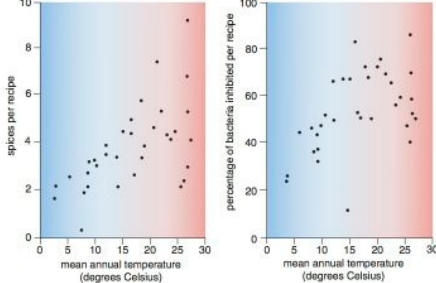
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Cultural Use of Spices



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Spice Use by Region



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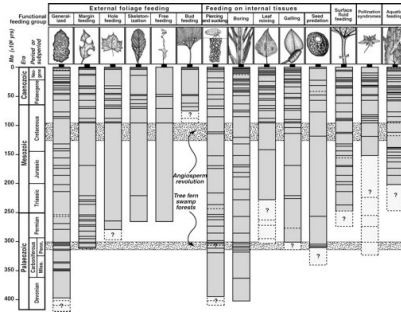
Silurian Land Plants

- 416-447 MYA
- Colonization of land
- Non-vascular mossy plants
- Insects quickly followed



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History of Insect Damage



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Plant Defenses

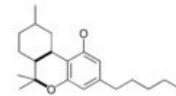
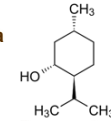
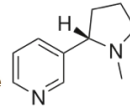
- Large herbivores deterred by physical defenses
- Spines
- Glandular trichomes
- Siliceous spicules



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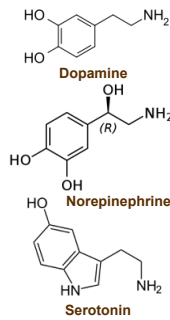
Plant Defenses

- Alkaloids
 - Nicotine
 - Caffeine
 - Morphine
 - Cocaine
- Terpenes
 - Citronella
 - Menthol
 - camphor
- Phenolics
 - Cannabinoids
 - Capsaicin
 - Salicylic acid



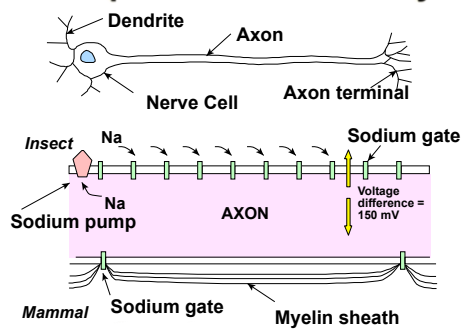
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Monoamine Neurotransmitters



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Non-specific Neurotoxicity



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Plant Monoamines

Phytohormone:
Indole-3-acetic acid
(auxin)

Fig. 2. Synthesis of 5-MT and a metabolite-catholite from tryptophan.

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Addictions

- Always originate in pain (conscious or unconscious)
 - Therefore, we should not ask “why the addiction?” but rather “why the pain?”
 - Dr. Gabor Maté, M.D.

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Addiction Definition

- Chronic neurobiological disease characterized by behaviours that include craving, compulsive use, continued despite harm
 - May be narcotic, alcohol or non-substance related

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Do Drugs Cause Addictions?

- Can J Medicine study (2006)
- 6000+ patients in chronic pain
- Taking narcotics, morphine
- No risk of addiction

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Do Drugs Cause Addictions?

- General Psychology study (1975)
- 20% of returning soldiers addicted to heroin
- Rate before war was 1%
- After war, levels dropped back to normal

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Crystal Meth in Canada

- From surveys
 - 4.6% have tried it
 - 0.5% in past year
- If was highly addictive those figures would be very similar

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Lab Rats

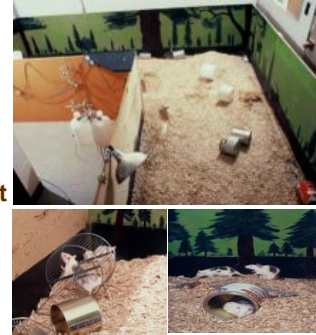
- Will self-administer cocaine and develop addictions
- But they are living in captivity under stressed conditions



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Rat Park

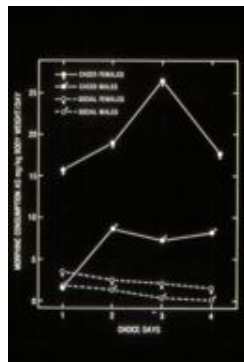
- Dr. Alexander @ SFU in 1980s
- Airy and spacious, scenic and comfortable
- Social environment
- 16-20 rats of both sexes
- 200x bigger than regular cages



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Rat Park Effect

- Rats uninterested in morphine dropper
- Added sugar solution, still uninterested
- Created cohort of addicts then put in 'rat park' and became disinterested in morphine



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Conclusion

- Drugs have addictive potential
- Animals can develop compulsive cravings
- Happy and healthy animals do not get addicted
 - Access to the drugs are not the source of the addiction
- Addictions are rooted in psychology of emotions, neurobiological systems
 - Stressed individuals are pre-disposed



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Absence of Stable Attachment

- Rats raised and kept in isolation developed fewer dopamine receptors
- Permanent disruption of incentive-motivation system in brain
- More likely to self-administer cocaine



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Drug Addiction in Humans

- Very high percentage experienced trauma
 - Physical, sexual and emotional abuse
- Children deprived of safe, nurturing attachment relationship are vulnerable to mood-enhancing drugs to feel 'normal' emotions and lubricants to help them interact socially with others



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Adverse Childhood Experiences

- Center for Disease Control and Prevention study
- Looked at incidence of 10 separate categories of ACE
 - For each ACE, risk of addiction rose by 2-4x
 - Subjects with 5+, risk was 10x greater



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National Inst. on Drug Abuse (2002 review USA)

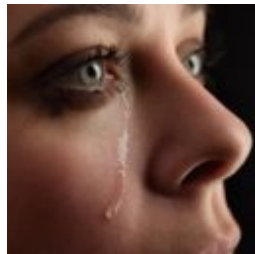
- Up to 100% of women drug abusers were victims of physical or sexual abuse
- Victims of both forms of abuse were 2x as likely to use drugs than those of one or the other
- Populations of substance abusers had met all criteria of suffering from PTSD



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Susceptibility to Addiction

- In humans almost all addicts have experienced a lifetime of pain and trauma
- The less effective our internal chemical happiness system, the more driven we are to compensate with drugs or alcohol



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Trauma and Brain Receptors

- Life experience that includes abuse, trauma and stress leads to underdevelopment of receptors in limbic system
- Leads to a deficit in stimulation of brain in emotions related to happiness, love, joy, connection
- Can be compensated for by drugs



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Testimonials in 'Hungry Ghosts'

- HIV-infected sex-trade worker summed up effects of opioids and her life history:
 - “the first time I tried heroin, it felt like a warm soft hug”



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Addictions and the Brain

- Involve 4 major systems in the brain
- Opioid apparatus
 - Attachment-reward / endorphins
- Dopaminergic system
 - Incentive-motivation / feel-good chemicals
- Self-regulation mechanisms
 - Pre-frontal and Orbito-frontal cortex
- Body-brain system
 - Stress-response and anxiety



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Trauma and the PFC/OFC

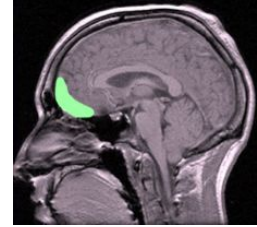
- Underdevelopment of these brain regions in frontal lobe lead to
 - Problems in assessing emotions in others
 - Impairs decision-making ability
 - Imbalance in short vs. long-term consequences
 - Evaluation of risk and uncertainty



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Trauma and the PFC/OFC

- Creates scenario that reinforces drug use, despite recognized harm
 - Overvaluing drugs and cravings
 - Undervaluing important aspects of life
 - Impairs judgement
 - Failure at inhibiting impulses



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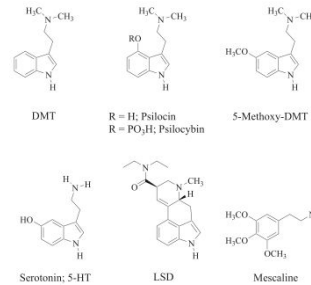
There is Hope

- Brain is highly plastic
- Neurons that fire together wire together
- Solution:
 - not in withdrawing drugs from brain, but removing their need
 - Remove haunting effect of traumas and allow brain to build healthy emotions



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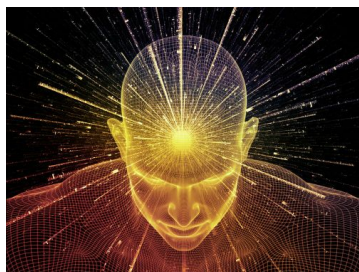
Psychedelics and Serotonin



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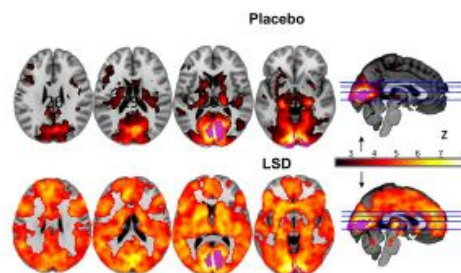
Psychedelics and Therapy

- Used to treat addictions, depression, OCD, PTSD, anxiety



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A Connected Brain on LSD



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