The Empress
Ancient Future – on Music from the Tea Lands (Putumayo)

Rasanblé
Beethova Obas - Music from the Chocolate Lands (Putumayo)

Caffeine

- Most widely used psychoactive drug
- Can cause dependence and interfere with functioning
- Belongs to a class of chemicals known as xanthines
History

- Three plants containing xanthines have been used by humans for thousands of years:
  - Coffee—from the Middle East
  - Tea—first grown in China
  - Cacao—from the Americas
- All three played important cultural and economic roles

Coffee: History

- Coffee originated in Ethiopia
  - Legend of its discovery by an Ethiopian goat herder, Kaldi, who noticed unusually boisterous activity in his goats after they consumed the berries
  - The practice then spread to Egypt and other Arabic countries by the 1400s, throughout the middle east by the 1500s and into Europe in the 1600s.

Coffee: History

- Coffeehouses spread: a location to relax, learn the news of the day, seal bargains, and listen and learn from literary and political figures
- England 1674: “The Women’s Petition Against Coffee” argued against the use of coffee on the grounds that it made men impotent

Coffeehouses: then and now
Coffee: History

- Coffee consumption in the United States
  - Use increased following taxation of tea and the American Revolution
  - Use also increased during and after Prohibition
  - Per capita U.S. coffee consumption
    - Peaked in 1946
    - Declined as soft drink consumption increased
    - Current = about 25 gallons of coffee per year

Coffee: Preparation

- Originally: people chewed on coffee beans or put raw beans in hot water
- Roasting improves the flavor, aroma, and color of the drink made from the beans
- Coffeehouses and individuals originally roasted and ground their own beans
- 1790: Commercial roasting
- 1900: Vacuum packing for long-term storage of ground coffee

Coffee Growing and Trade

- About half of American coffee comes from Latin America, the rest from Vietnam, Indonesia, and Thailand
  - Over $5 billion was imported to the US in 2008
- Variations in coffee characteristics
  - Different varieties of the coffee shrubs
    - *Coffea arabica* - milder flavor, takes longer to develop after planting and requires a near tropical climate to grow.
    - *Coffea robusta* - stronger and more bitter flavor and a higher caffeine content, used in less expensive blends and to make instant coffee.
Coffee Varieties

- Black
- Espresso
- Cappuccino
- Latte
- Turkish
- Half-caf
- Iced
- Flavored
- and many more

Decaffeinated coffee

- **Soaking unroasted beans** in an organic solvent removes the caffeine
- Alternative Swiss water process not widely used
- It removes more of the coffee's flavor
- **Caffeine removed from coffee is used in the manufacture of soft drinks**

Coffee and Caffeine

- The **caffeine content** of coffee depends on how it is prepared:

<table>
<thead>
<tr>
<th>Type</th>
<th>Average caffeine content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brewed, drip (5 oz)</td>
<td>115 mg</td>
</tr>
<tr>
<td>Brewed, percolator (5 oz)</td>
<td>80</td>
</tr>
<tr>
<td>Instant (5 oz)</td>
<td>65</td>
</tr>
<tr>
<td>Decaffeinated, brewed (5 oz)</td>
<td>3</td>
</tr>
<tr>
<td>Decaffeinated, instant (5 oz)</td>
<td>2</td>
</tr>
</tbody>
</table>
Tea is second only to water as the most widely consumed beverage in the world.

Tea (Camellia sinensis) originated in China
- Legend of its creation by Daruma, the founder of Zen Buddhism, who cut off his eyelids to remain awake while meditating.
- A new plant grew from the spot where his eyelids touched the earth, with leaves that made a brew that would keep a person awake.

AD 350: Chinese manuscript describes many medicinal uses
AD 780: Nonmedical cultivation and use of tea; Lu Yu, Chinese tea master of the 8th c.

1610: Dutch delivered tea to Europe
English East India Company
- Concentrated on importing spices, so the first tea was taken to England by the Dutch.
- As demand grew, the company expanded its imports from China.
- Became the world's first multinational corporation.
Most tea sold in coffeehouses
In Britain, major marketing campaigns promoted the switch from coffee to tea
- After the American Revolution, to be a tea drinker was to be loyal to the Crown
Tea: History

- Tea and the American Revolution
  - American colonists were big tea drinkers
  - Anger over a tax on tea that they had not helped formulate
    - "Taxation without representation"
  - Legal tea sales dropped due to a boycott
  - Illegal smuggling of tea increased

Tea: History

- Tea and the American Revolution
  - A special arrangement was made for the English East India Company, giving them a monopoly and angering American merchants

  The result was "The Boston Tea Party" of 1773

Tea Consumption

- Annual per capita tea consumption
  - 4.5 pounds in the United Kingdom
  - .5 (1/2) pound in the United States
  - Tea starts its life on a four- to five-foot bush high in the mountains of China, Sri Lanka, India or Indonesia.
Tea Production

- Bushes are regularly pruned to aid in harvesting new growth
- Tea leaves are picked by hand, about every 6 to 10 days
- Preparation: tea leaves are
  - Dried
  - Rolled to crush the cells in the leaves
  - Placed in a cool, damp place for fermentation (oxidation)

Tea Varieties

- Black tea is fully oxidized leaves
- Green tea is slightly oxidized leaves
- White tea is nonoxidized leaves

Tea Varieties

- Iced tea (orig. 1904, Louisiana Purchase Exposition, St. Louis) accounts for 75 percent of all tea consumed in U.S.
- Flavored teas are mixtures of tea and mint, spices, or other flavors
- Herbal teas contain a mix of plant leaves and flowers but no actual tea (see right)
Tea Xanthines

- **Caffeine**
  - Pound for pound, tea has more caffeine than coffee
  - *BUT*
    - 1 pound of tea leaves = 200 cups of tea
    - 1 pound of coffee = 50 to 60 cups of coffee
  - Tea has about 40 to 60 mg of caffeine per cup depending on the type and strength of the brew

- **Theophylline**
  - Tea contains a very small amount of theophylline
  - In high doses, theophylline is used as an asthma medication

Chocolate: History

- **Chocolate originated in Mesoamerica**
  - *Legend:* Cacao tree was a gift to humans from paradise from the Aztec god Quetzalcoatl
  - Linnaeus named the cacao tree *Theobroma*, meaning “food of the gods”
  - Aztecs cultivated cacao widely, and the cacao bean was an important part of their economy and culture

- **Chocolatl**—from the Mayan words *choc* (“warm”) and *latl* (“beverage”)—was a thick, bitter liquid flavored with vanilla
- **Cortez** introduced chocolate into Europe
  - Chocolate drinking spread slowly
  - Chocolate was often sold alongside coffee and tea in established coffeehouses
Prior to 1828, the traditional Aztec process was still used

- Cacao pods were dried in the sun, then roasted to remove the husk
- Kernels were ground to obtain a thick liquid (baking chocolate)

1828: Dutch patent issued for a process that removes about two-thirds of the fat (cocoa butter) and produces a powder

1876: Milk chocolate introduced by the Swiss

A mixture of cocoa butter, sugar, and chocolate powder can be formed into slabs or bars

Properly manufactured true chocolate melts at body temperature
Chocolate Xanthines

- **Theobromine**
  - Chocolate contains the unique xanthine theobromine
  - It acts in a parallel fashion to caffeine, but it is much less potent in its CNS effects

- **Caffeine**
  - An average cup of cocoa contains about 4 mg of caffeine

Caffeine and Culture

- The cultural effects of caffeine have been far-reaching
  - Propped-up legends (Lu Yu)
  - Prompted revolutions (American Revolution, eg.)
  - Practices of slavery (Burkina Faso)
  - These abuses have created a strong movement toward Fair Trade

Other Sources of Caffeine

- **Soft Drinks: Coca-Cola**
  - Developed as a nerve tonic in the late 1800s; ingredients included:
    - Caramel
    - Fruit flavoring
    - Phosphoric acid
    - Caffeine
    - A secret mixture called Merchandise No. 5
  - Named for two flavoring agents: coca leaves and cola (kola) nuts
  - Up until 1906, the beverage did contain a small amount of cocaine
Other Sources of Caffeine

- Other soft drinks
  - All types of soft drinks are popular
  - U.S. per capita soft drink consumption is about 50 gallons per year
- Energy drinks
- Over-the-counter medications

Caffeine Content

<table>
<thead>
<tr>
<th>Item</th>
<th>Caffeine Content (mg)</th>
<th>Serving</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brewed coffee</td>
<td>40-180</td>
<td>5 oz</td>
</tr>
<tr>
<td>Instant coffee</td>
<td>30-120</td>
<td>5 oz</td>
</tr>
<tr>
<td>Decaffeinated coffee</td>
<td>1-5</td>
<td>5 oz</td>
</tr>
<tr>
<td>Tea</td>
<td>20-110</td>
<td>5 oz</td>
</tr>
<tr>
<td>Cocoa</td>
<td>5-20</td>
<td>5 oz</td>
</tr>
<tr>
<td>Diet Coke</td>
<td>47</td>
<td>12 oz</td>
</tr>
<tr>
<td>Pepsi One</td>
<td>54</td>
<td>12 oz</td>
</tr>
<tr>
<td>Mountain Dew</td>
<td>54</td>
<td>12 oz</td>
</tr>
<tr>
<td>Jolt</td>
<td>72</td>
<td>12 oz</td>
</tr>
<tr>
<td>Red Bull</td>
<td>80</td>
<td>8.3 oz</td>
</tr>
<tr>
<td>Milk chocolate bar</td>
<td>1-15</td>
<td>1 oz</td>
</tr>
<tr>
<td>Dark chocolate bar</td>
<td>5-35</td>
<td>1 oz</td>
</tr>
<tr>
<td>Vivarin stimulant dose</td>
<td>200</td>
<td>1 dose</td>
</tr>
</tbody>
</table>

Pharmacology

- Three key xanthines
  - Caffeine
  - Theophylline
  - Theobromine
- Time course
  - Rapid absorption if taken orally
  - Peak levels reached in 30 minutes
  - Half-life is about 3 hours
- Dependence
  - Reinforcing properties
  - Withdrawal symptoms include headache and fatigue
Mechanism of action
- Xanthines block inhibitory receptors for adenosine, thereby having a stimulant effect

Physiological effects
- Stimulates the CNS and skeletal muscles
- Causes sleep disturbances
- Elevates mood
- Constricts blood vessels in the brain
  - May explain the ability of caffeine to reduce migraine headaches

Stimulation
- Caffeine partially offsets the effects of fatigue on both mental and physical tasks, but it may not improve performance in well-rested individuals
- High caffeine consumption among college students is associated with lower academic performance
- Headache treatment: Helps relieve both migraine and nonmigraine headaches
- Hyperactivity treatment: High doses may decrease hyperactivity
- Sobering up?
  - Caffeine does not lower blood alcohol concentration and will not help a person sober up

There is no clear evidence that moderate caffeine consumption is dangerous
Cancer: Caffeine is not a risk factor in human cancer
Reproductive effects:
- High consumption of caffeine reduces a woman’s chances of becoming pregnant and slows the growth of the fetus
- Research is mixed on whether caffeine increases the risk of miscarriage
Heart disease: High intake of caffeine may increase the risk of heart attack, particularly in people with other risk factors
Causes for Concern

**Caffeinism (excessive use of caffeine)**

- **Toxicity is relatively low**
  - It would require about 100 cups of coffee to receive a fatal dose from oral caffeine

- **Unpleasant symptoms do occur:**
  - Nervousness
  - Irritability
  - Tremors
  - Muscle twitching
  - Insomnia
  - Flushed appearance
  - Elevated temperature
  - Palpitations
  - Heart arrhythmias
  - Gastrointestinal disturbances