

Studying Drug Addiction as a Brain Disease

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What Works

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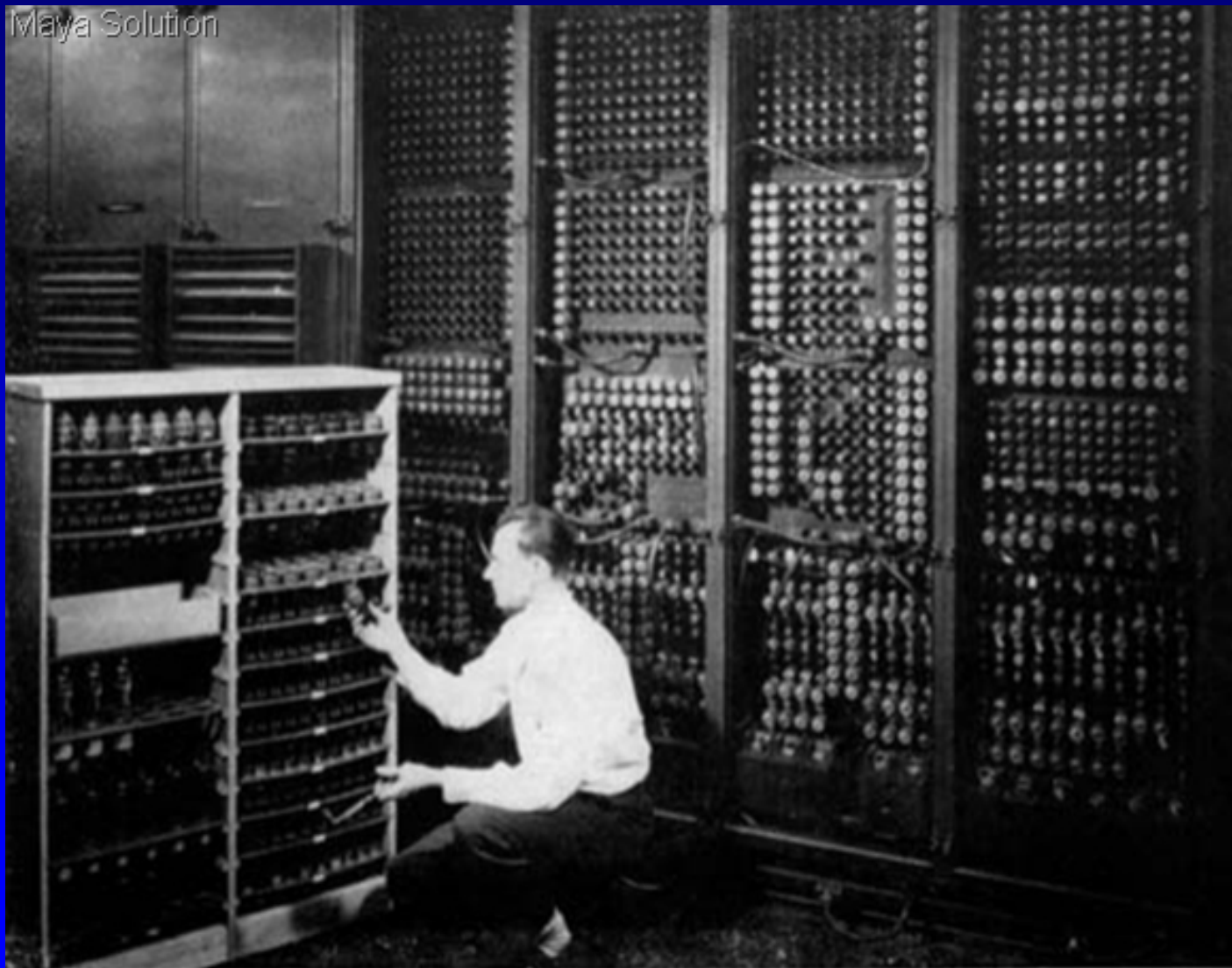
**Advances in Science
Have Revolutionized Our
Way of Life...
And Our Fundamental Views of
Drug Abuse and Addiction**

Remember Ohura's Communicator? Science Fiction? Or Science Fact?



Then...

Maya Solution



Replacing a bad tube meant checking among ENIAC's 19,000 possibilities.

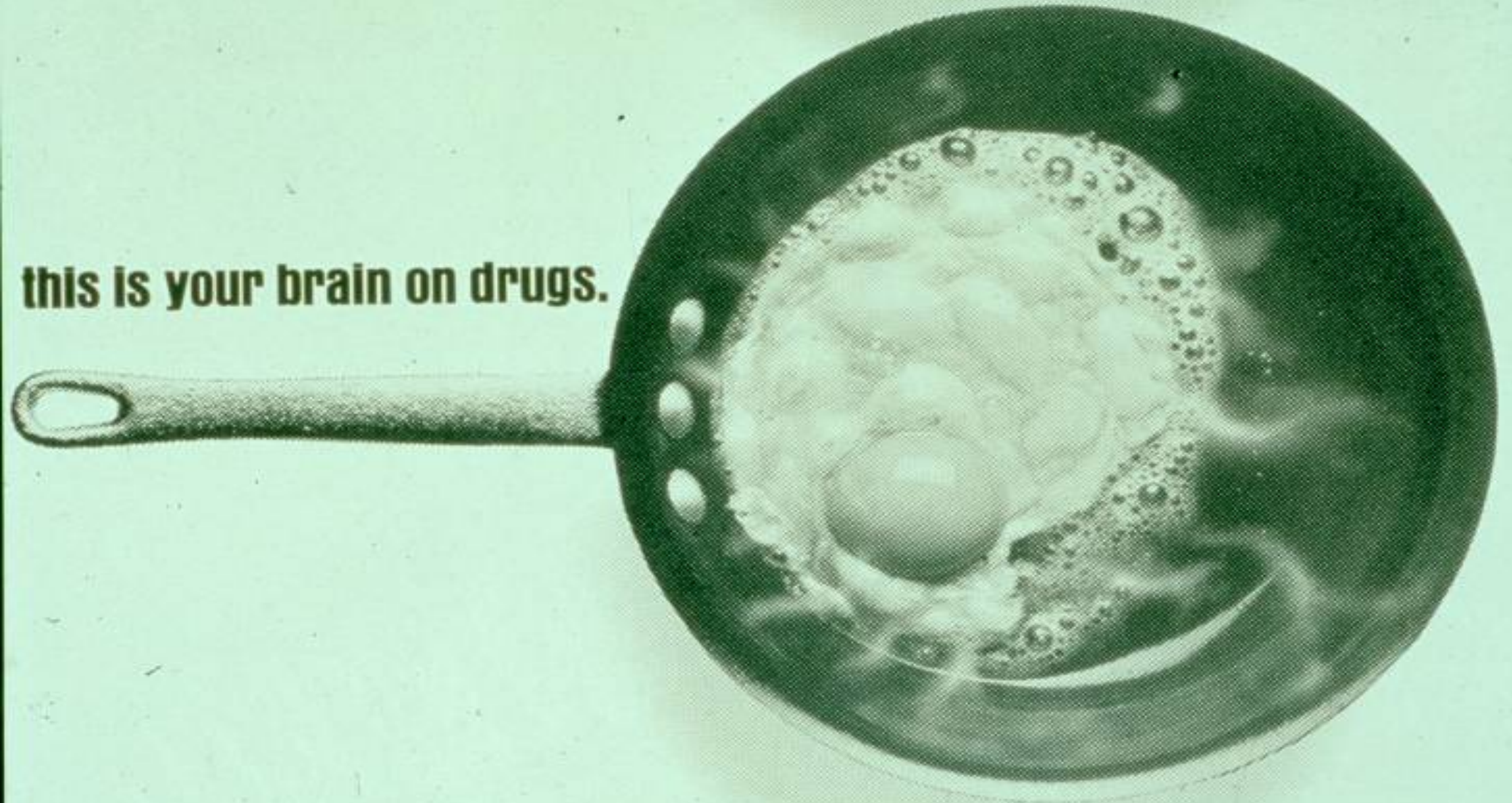
And Now

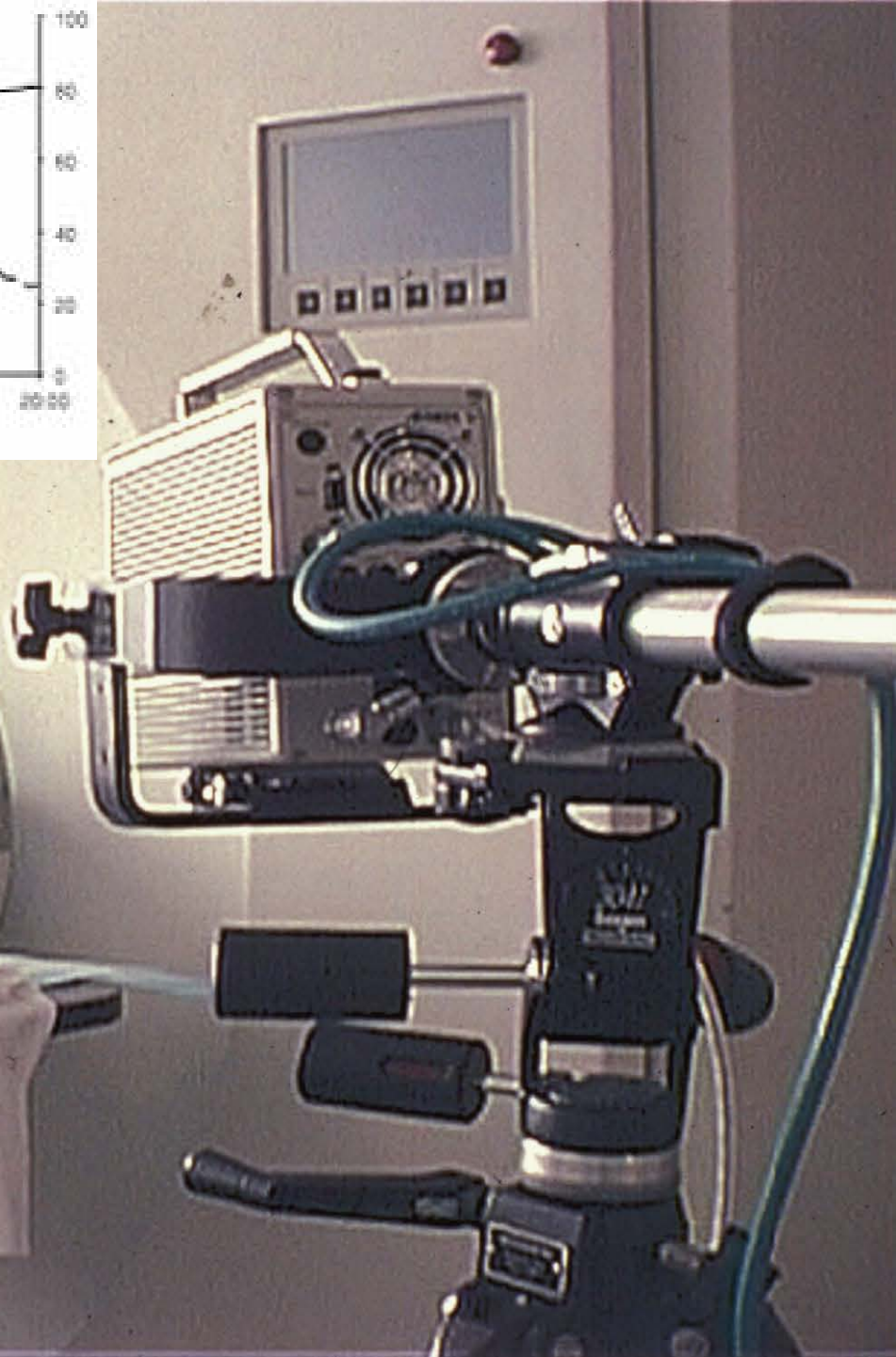
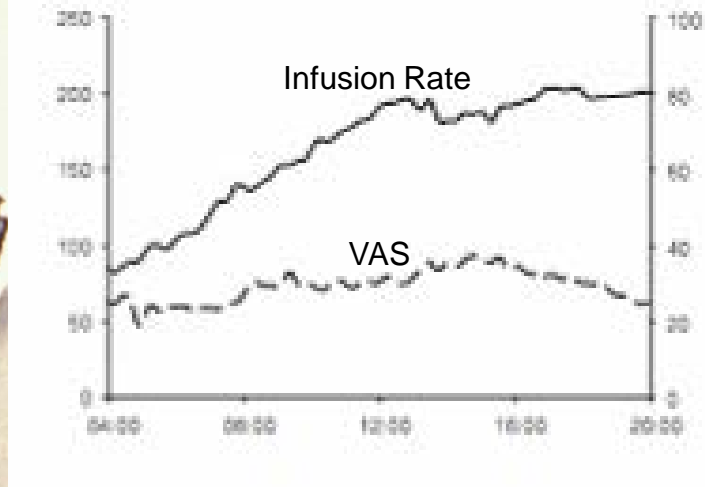
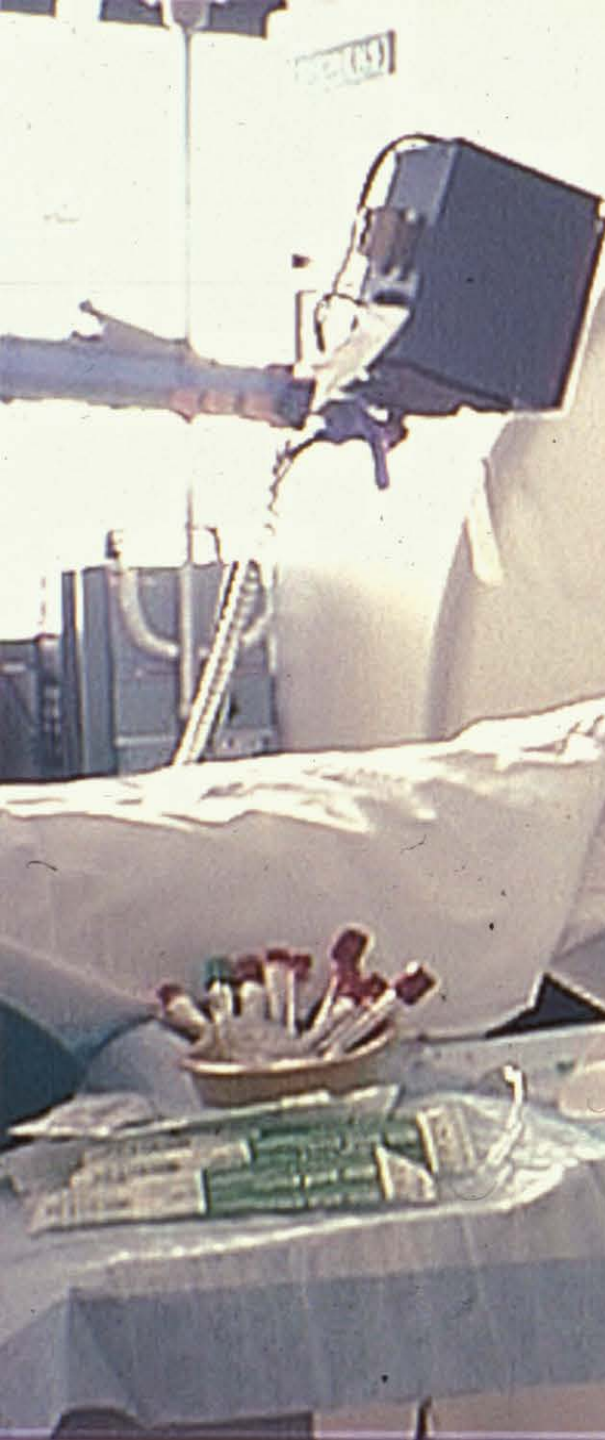


Advances in Science
Have Revolutionized Our
Fundamental Views of
Alcohol and Drug Abuse and
Addiction

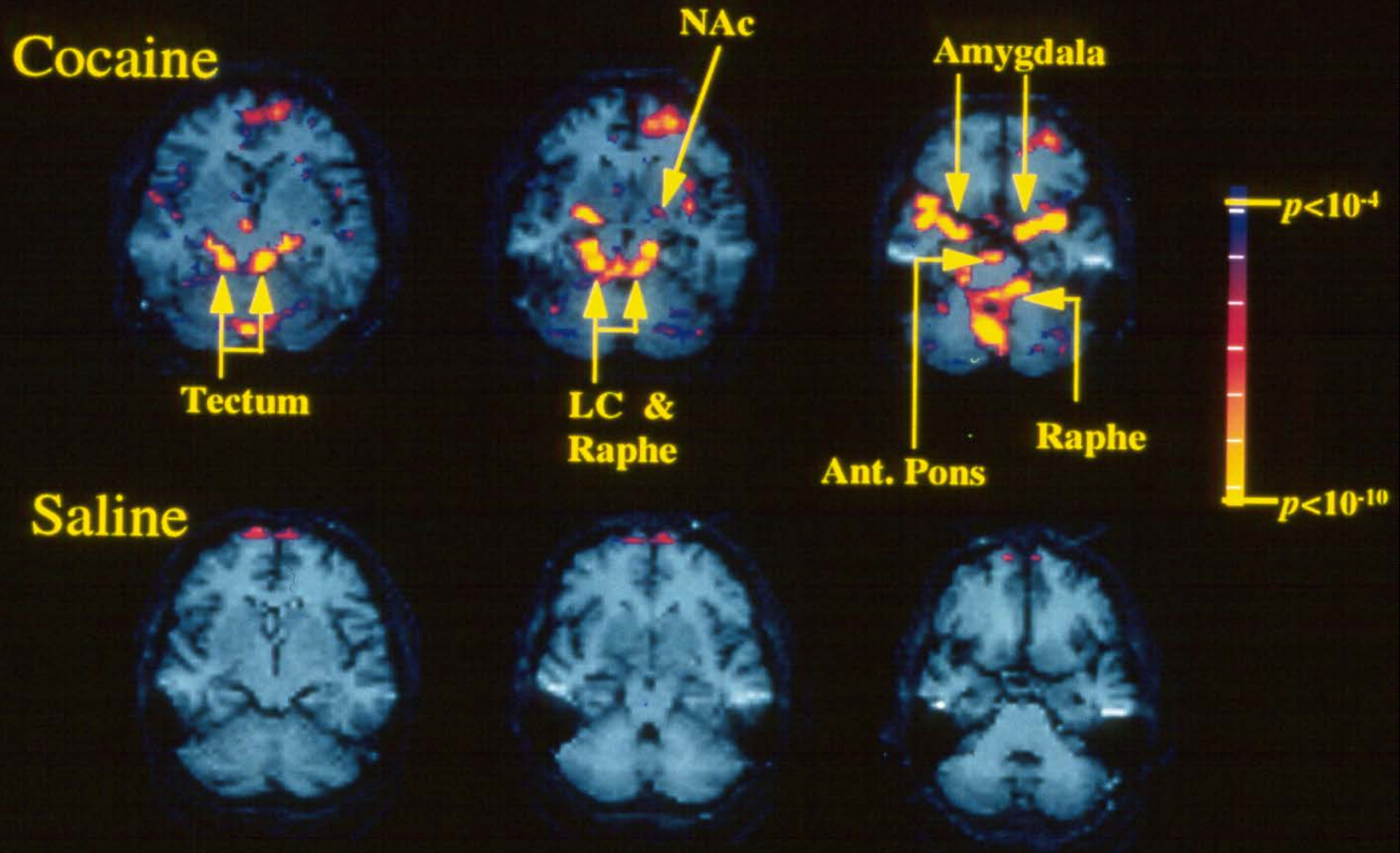
Your Brain on Drugs - Then

this is your brain on drugs.





Your Brain on Drugs – Now



MGH-NMR Center & Dept. of Psychiatry

Source: Breiter & Rosen, Ann N Y Acad Sci 1999

What have we learned?

Drug Abuse Is A Preventable Behavior

Drug Addiction Is A Treatable Disease

Partnership for a Drug Free America

Why ?

Why do people take drugs?

Drug Abuse Risk Factors

Community



Peer Cluster



Family



Individual

Why do people take drugs?

To feel good
To have novel:
Feelings
Sensations
Experiences
AND
To share them



To feel better
To lessen:
Anxiety
Worries
Fears
Depression
Hopelessness
Withdrawal

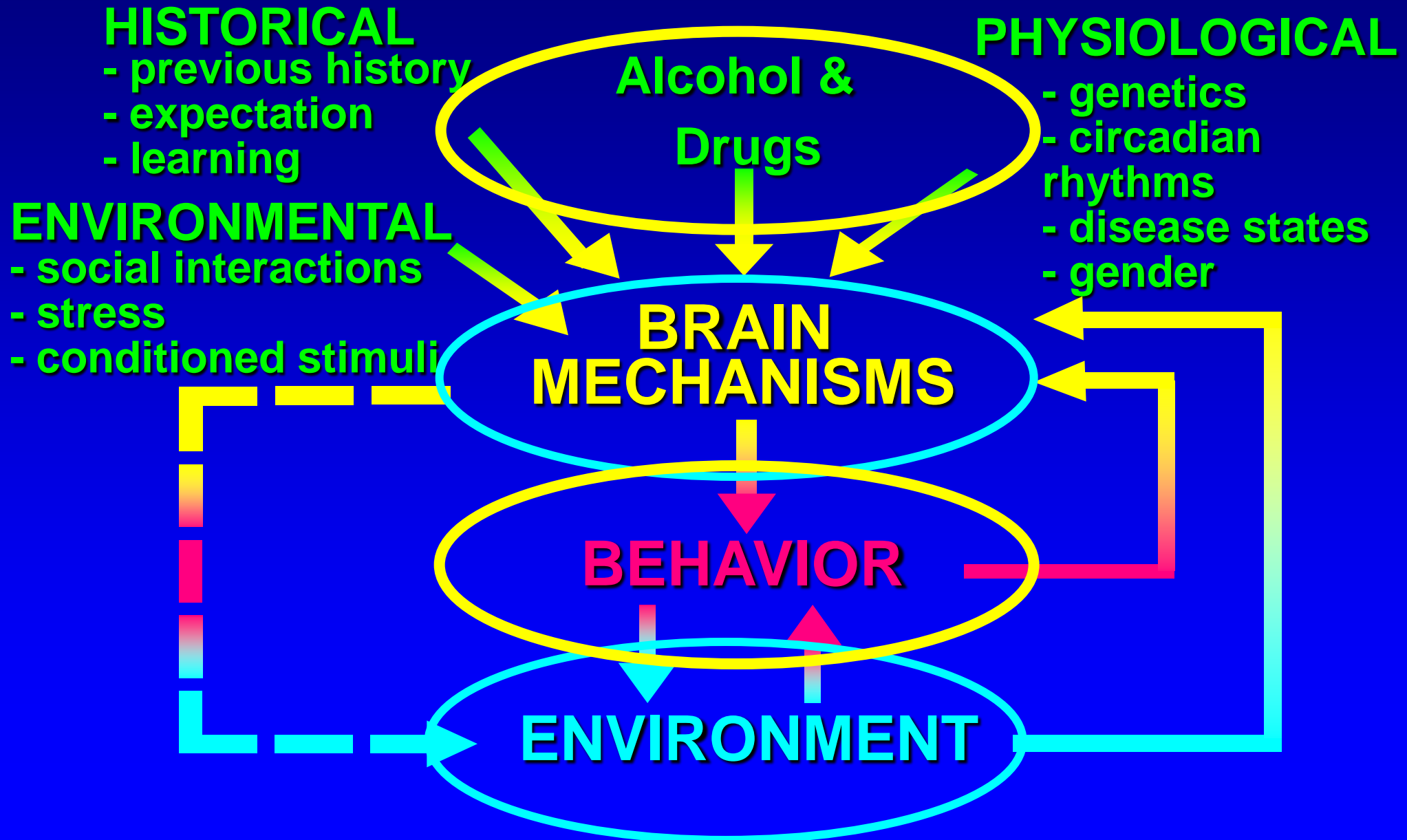
Drawings courtesy of Vivian Felsen



**A Major Reason People
Take a Drug is They Like
What It Does to Their Brains**

Addiction:

A Complex Behavioral and Neurobiological Disorder



What have we learned about Vulnerability?

**Why do some people
become addicted while
others do not?**

Drug Abuse Risk Factors

Community



Peer Cluster



Family

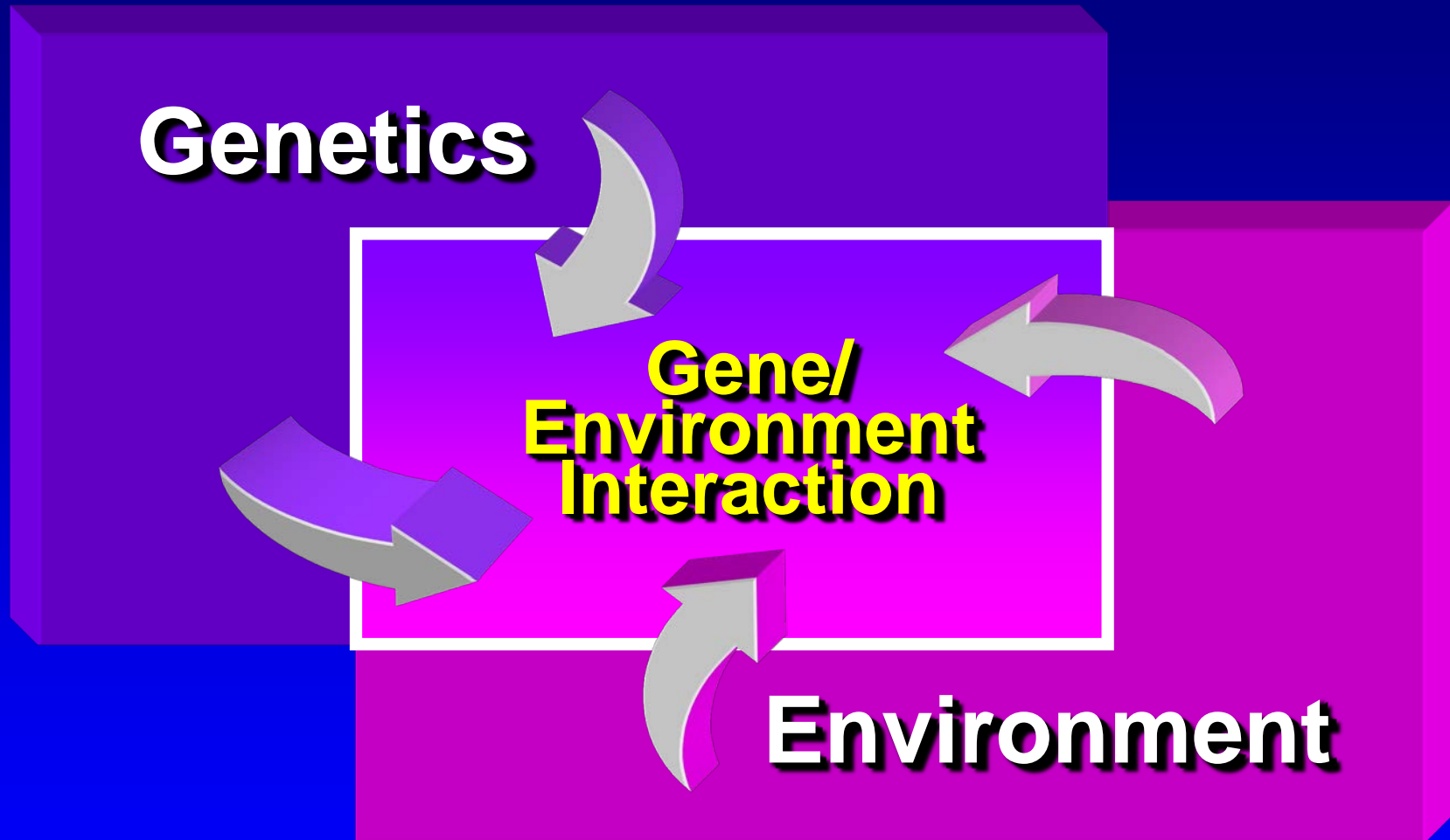


Individual

Genetics

**Gene/
Environment
Interaction**

Environment



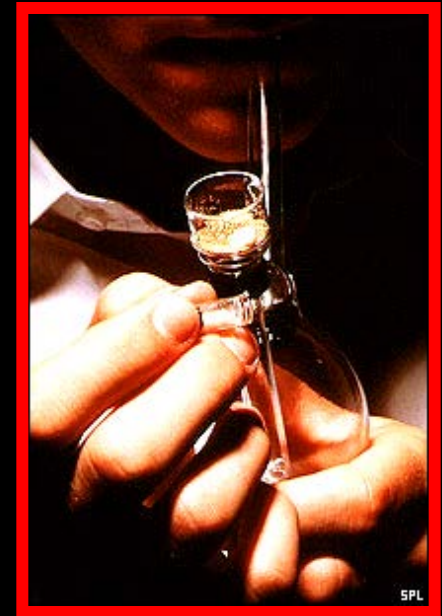
Effects of Social Stressors on Illicit and Licit Drug Use



**1. *Facilitate
Initiation***



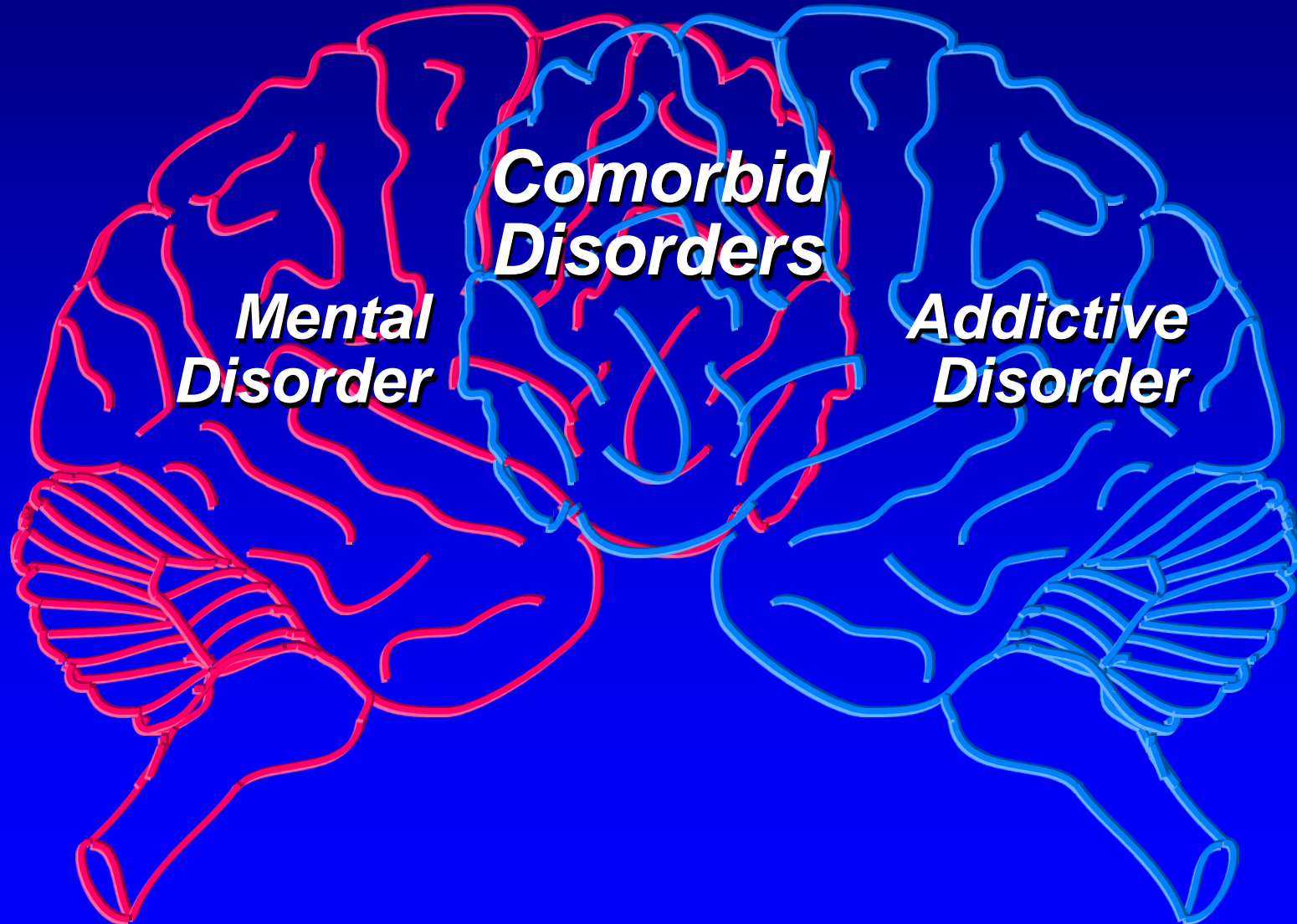
**2. *Increase Risk
of Addiction***



3. *Trigger Relapse*

***What have we learned about
other aspects of vulnerability?***

ADDICTIVE DISORDERS OFTEN CO-EXIST WITH MENTAL DISORDERS

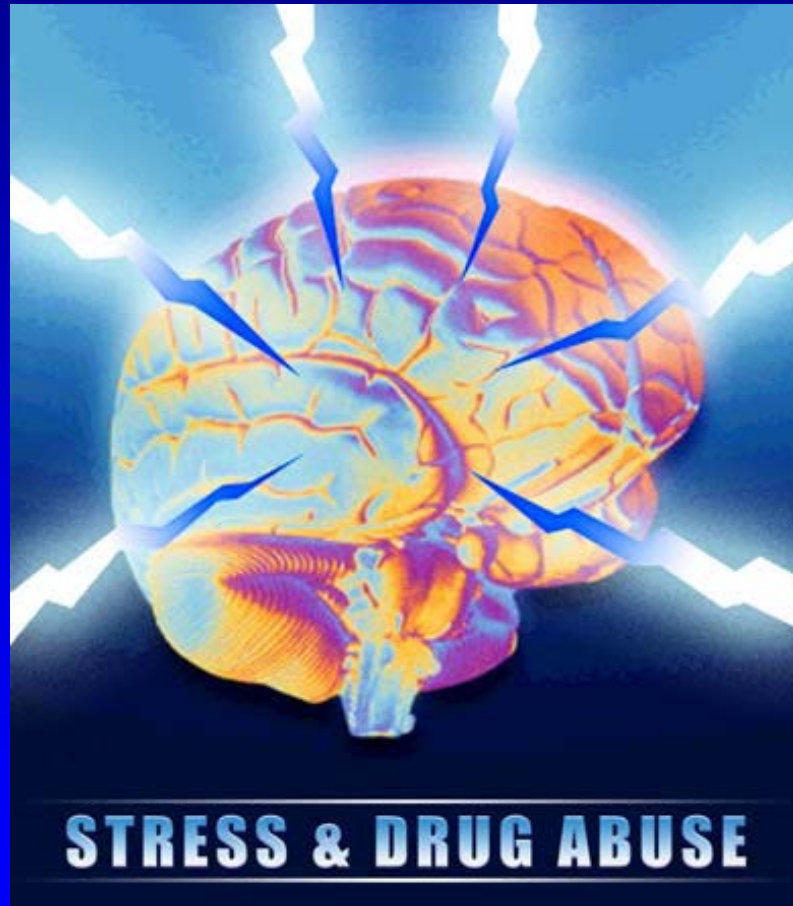


Between 30 and 60 percent of drug abusers have concurrent mental health diagnoses - including personality disorders, major depression, schizophrenia, and bipolar disorder

Many Common Factors Are Involved in Addiction and Mental Illness

Addiction:

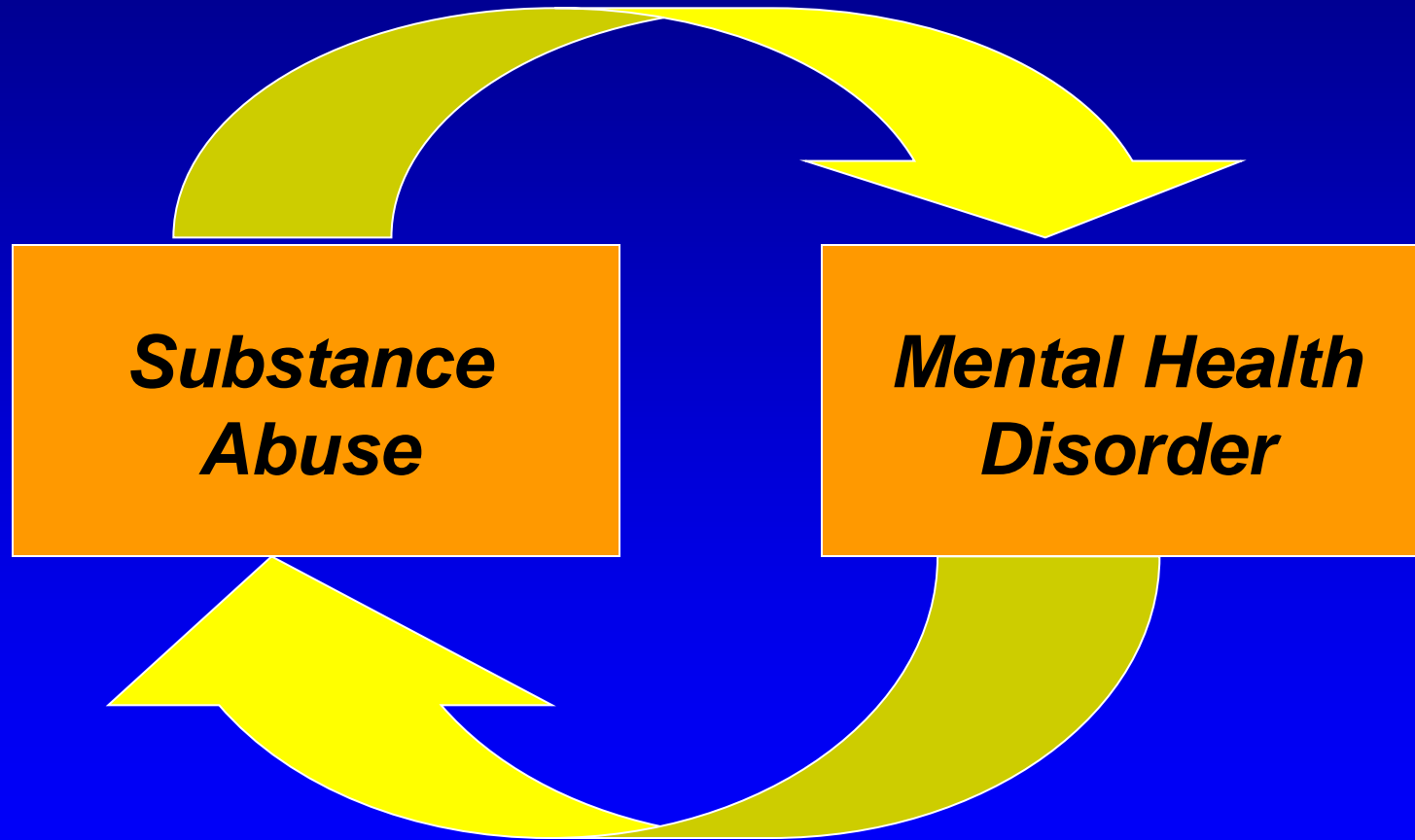
- *Early Physical or Sexual Abuse*
- *Stress*
- *Family History*
- *Mental Illness*
- *Peers who use Drugs*



Mental Illness:

- *Early Physical or Sexual Abuse*
- *Stress*
- *Family History*
- *Drug and Alcohol Abuse*

Which Came First?



Why Do Mental Illnesses and Substance Abuse Co-occur?



- **Self-medication hypothesis**

Substance abuse begins as a means to alleviate symptoms of mental illness

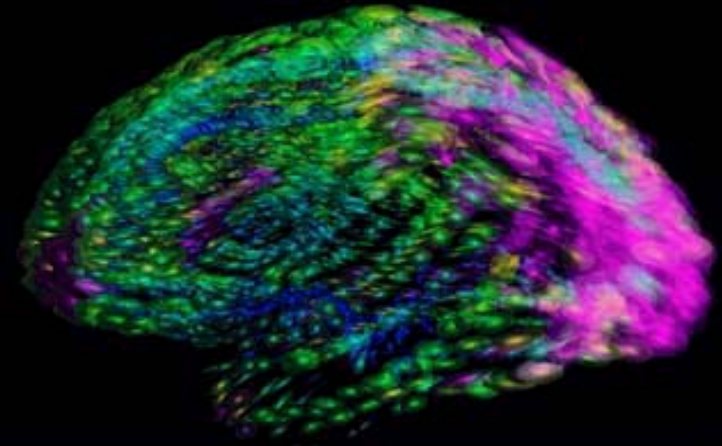
- **Causal effects of substance abuse**

Substance abuse may increase vulnerability to mental illness

- **Common or correlated causes**

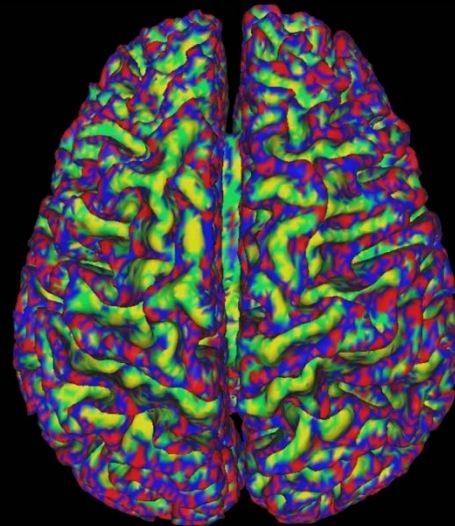
The life processes and risk factors that give rise to mental illness and substance abuse may be related or overlap

Comorbidity Is a Reality



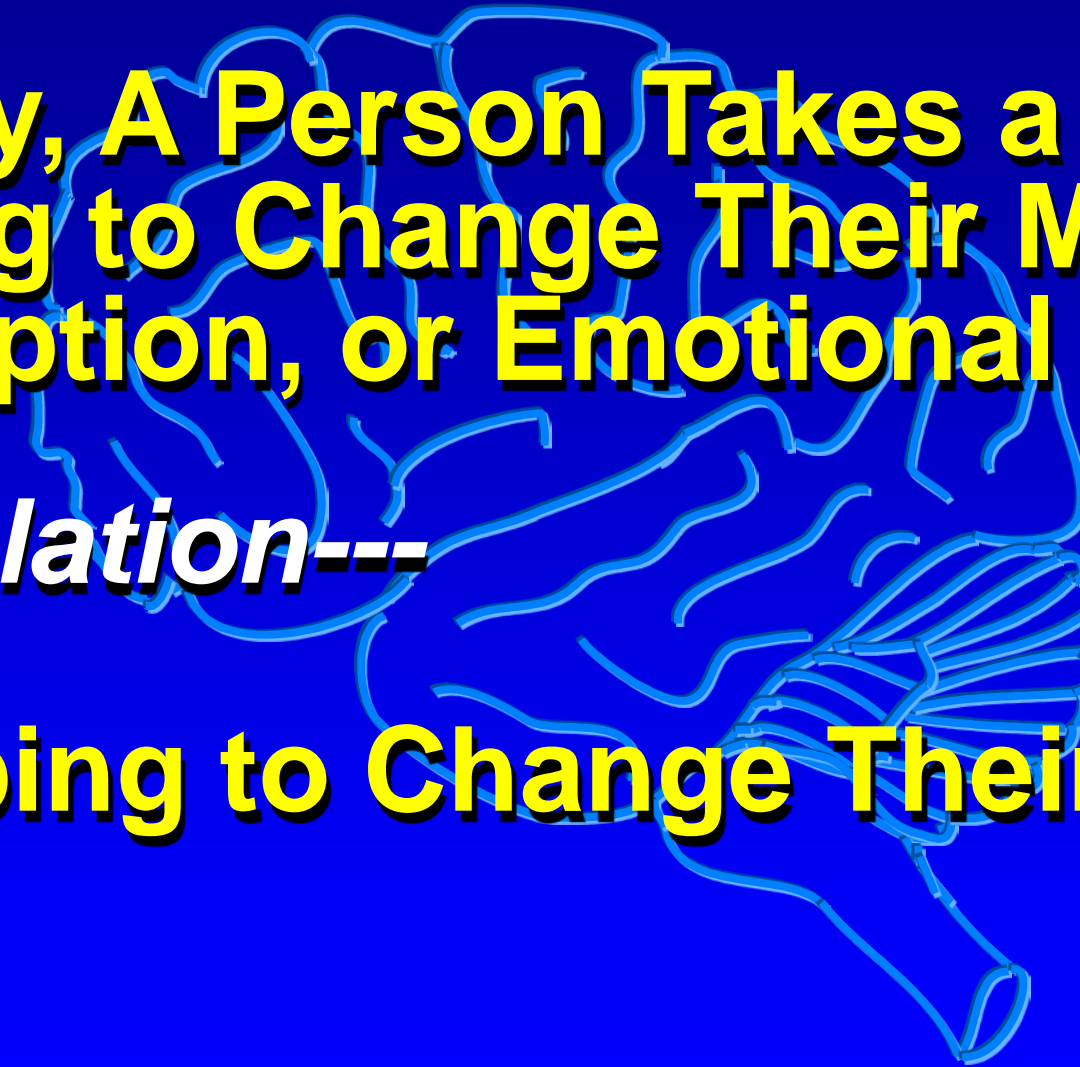
Why Do People Take Drugs?

They Like What Drugs Do to Their Brains



**Initial Drug Use Is A
Voluntary Behavior...**

**A Person *Chooses* to
Take a Drug for the First Time**

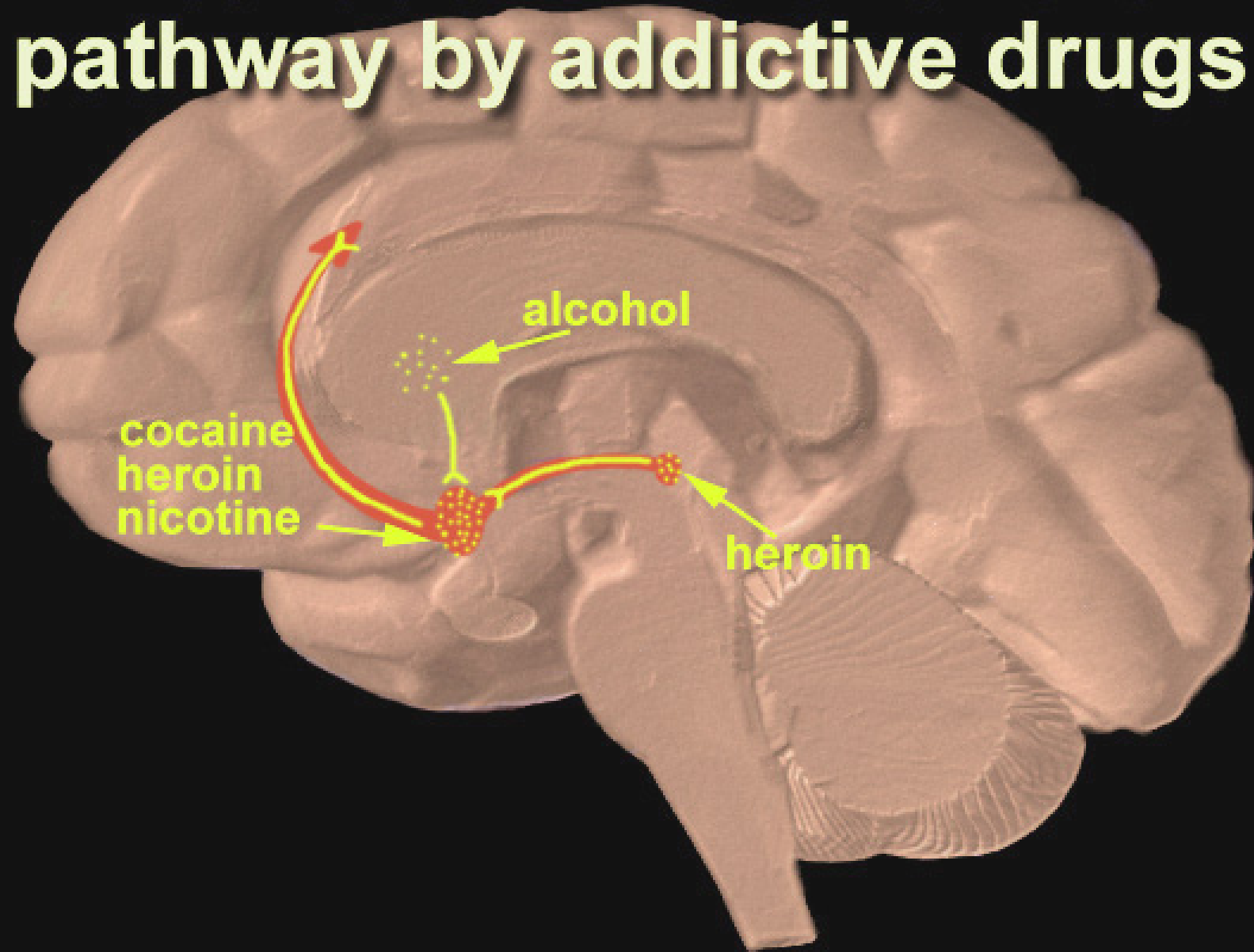


**Initially, A Person Takes a Drug
Hoping to Change Their Mood,
Perception, or Emotional State**

Translation---

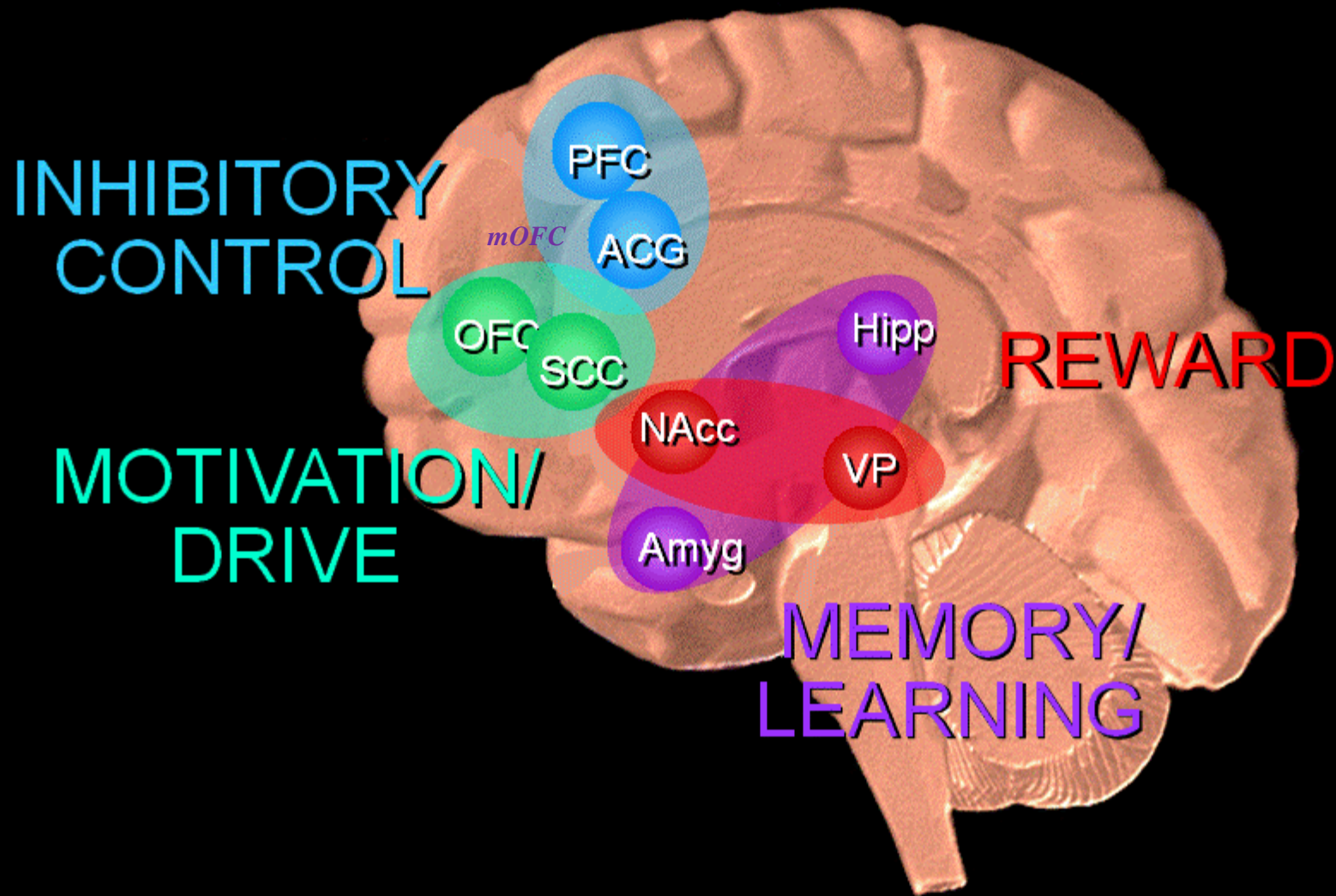
...Hoping to Change Their *Brain*

Activation of the reward pathway by addictive drugs

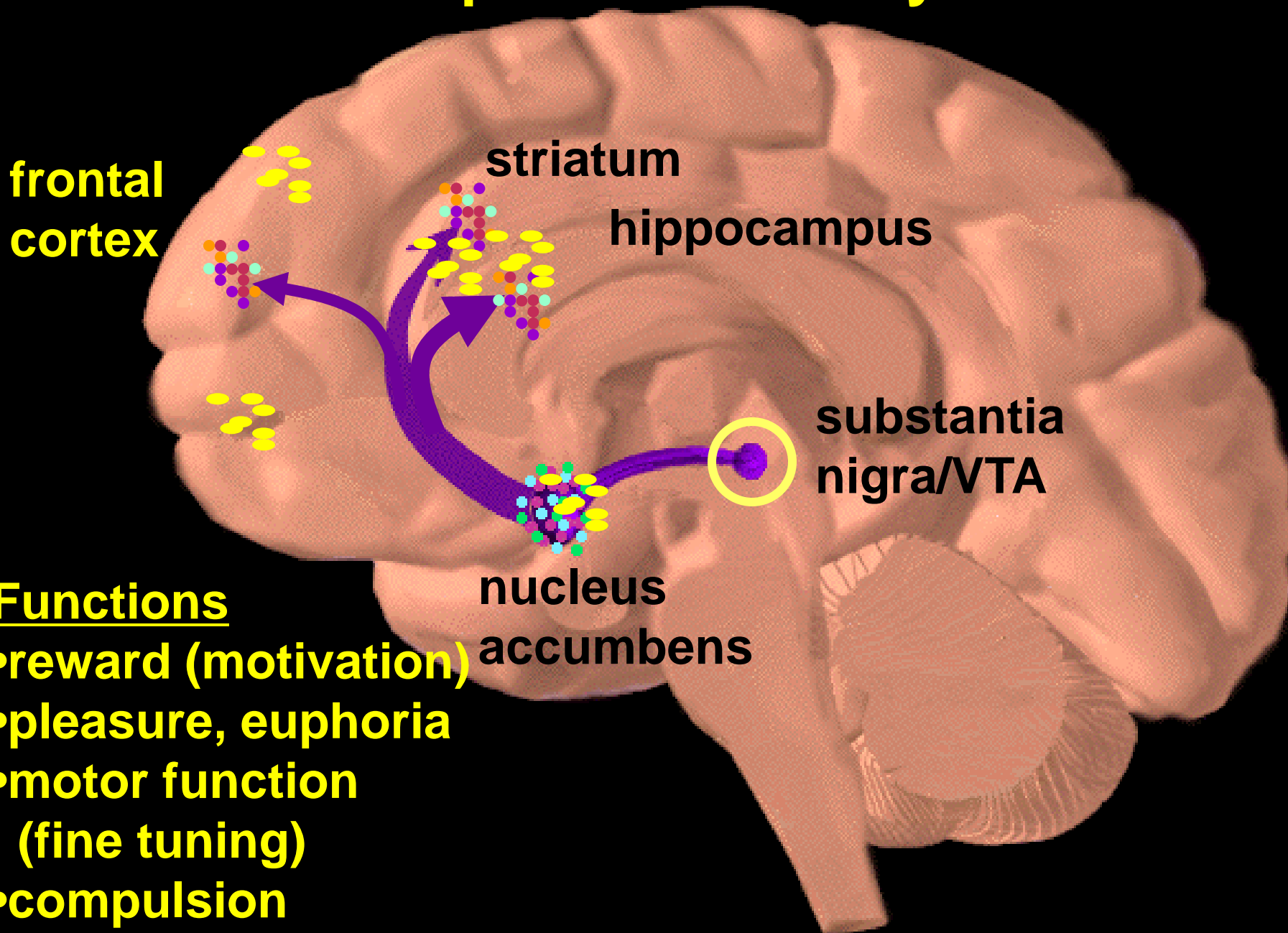


We Know That...
In Combination with Many
Other Transmitter Systems, and
Despite Their Many Differences,
Most Abused Substances Enhance
Dopamine Activities

Circuits Involved In Drug Abuse and Addiction

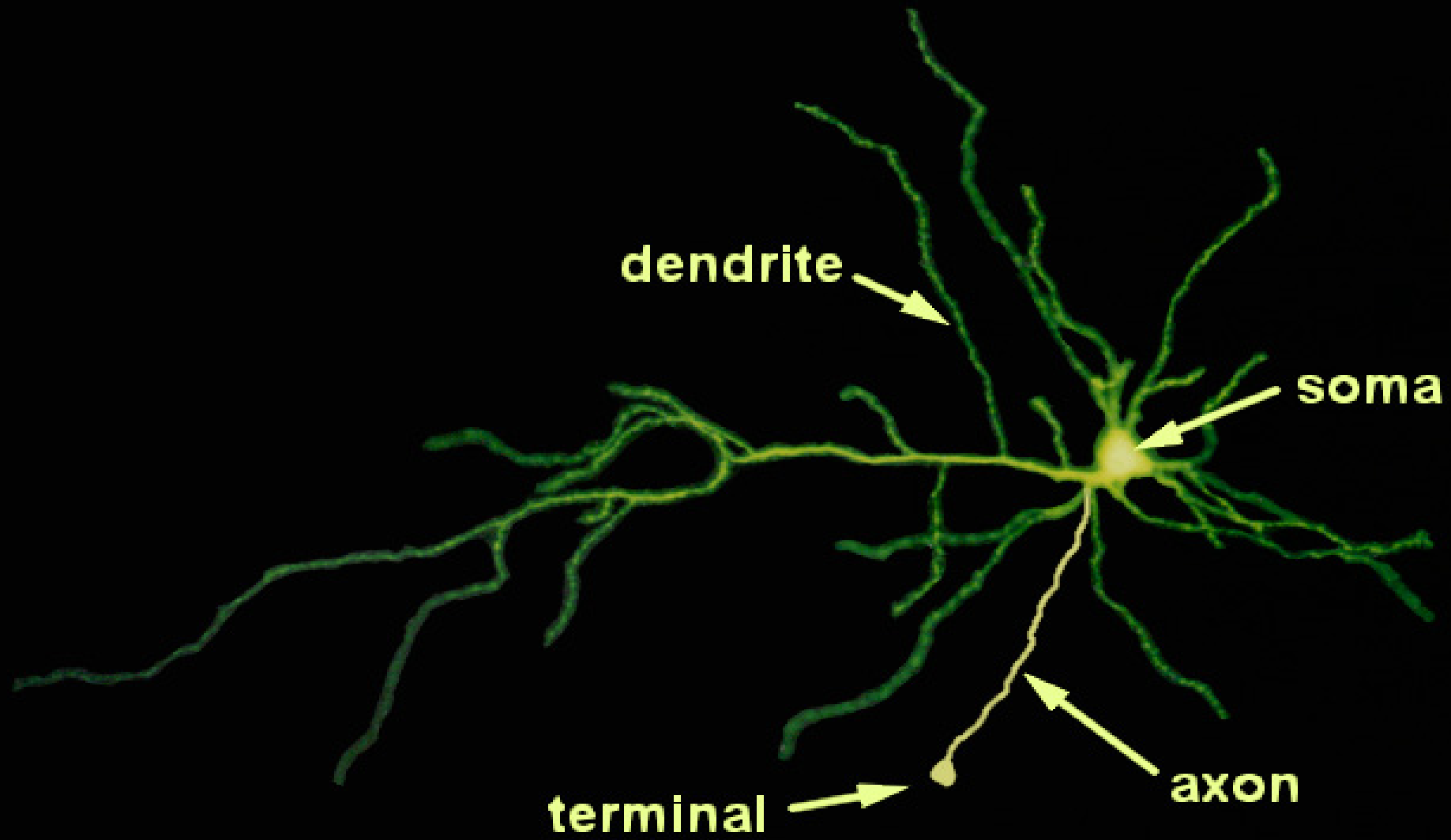


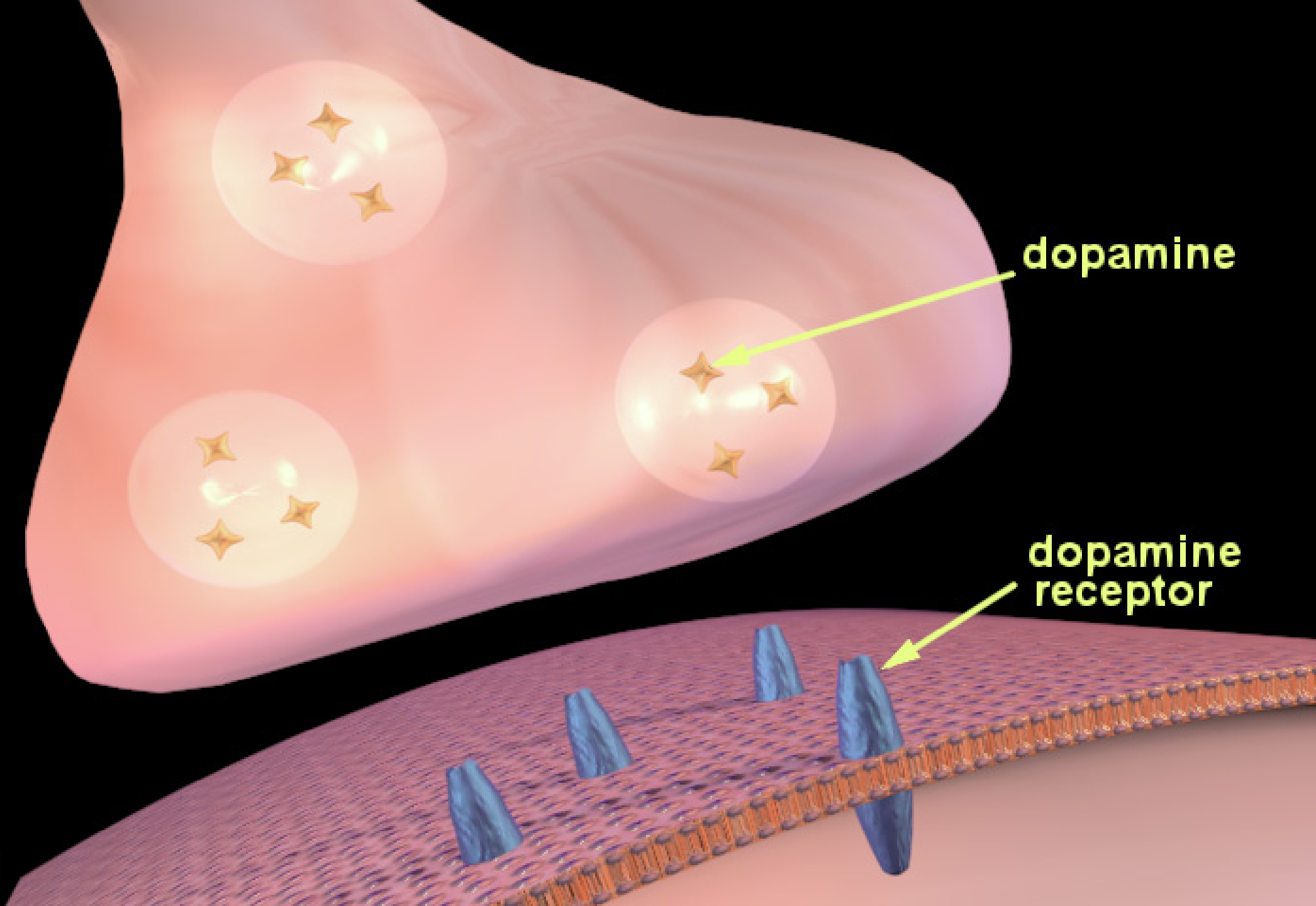
Dopamine Pathways



Functions

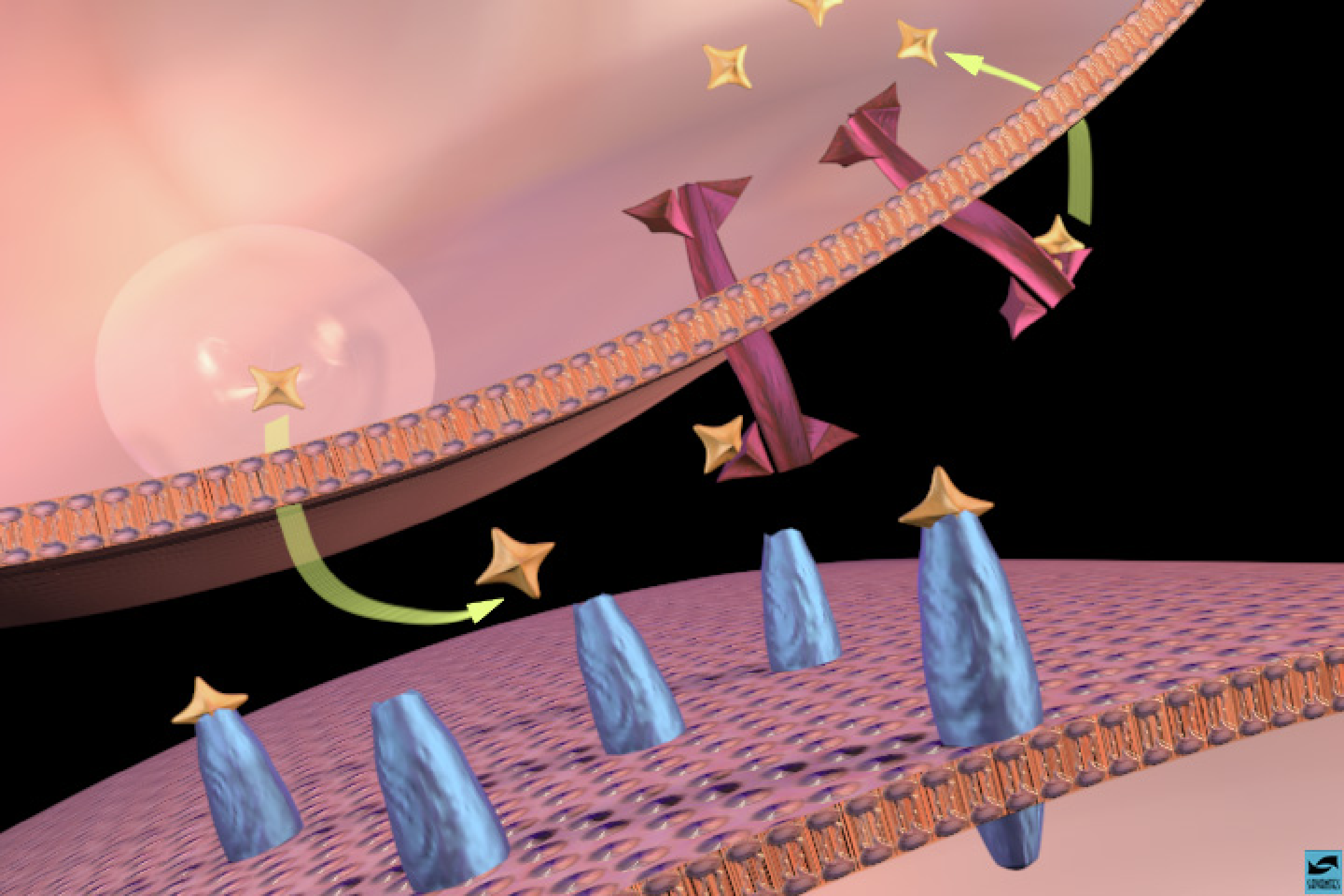
- reward (motivation)
- pleasure, euphoria
- motor function (fine tuning)
- compulsion





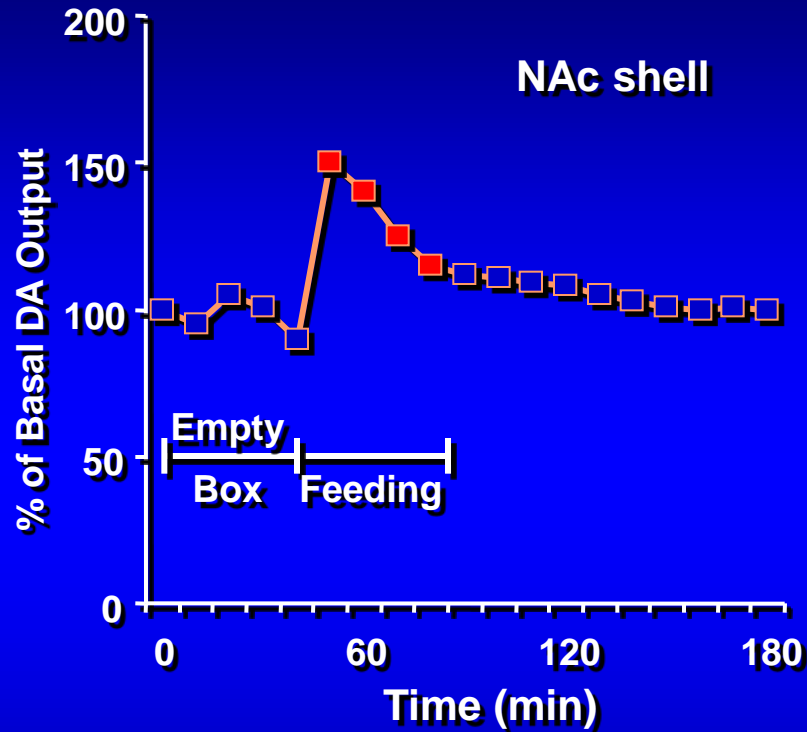
dopamine

dopamine
receptor



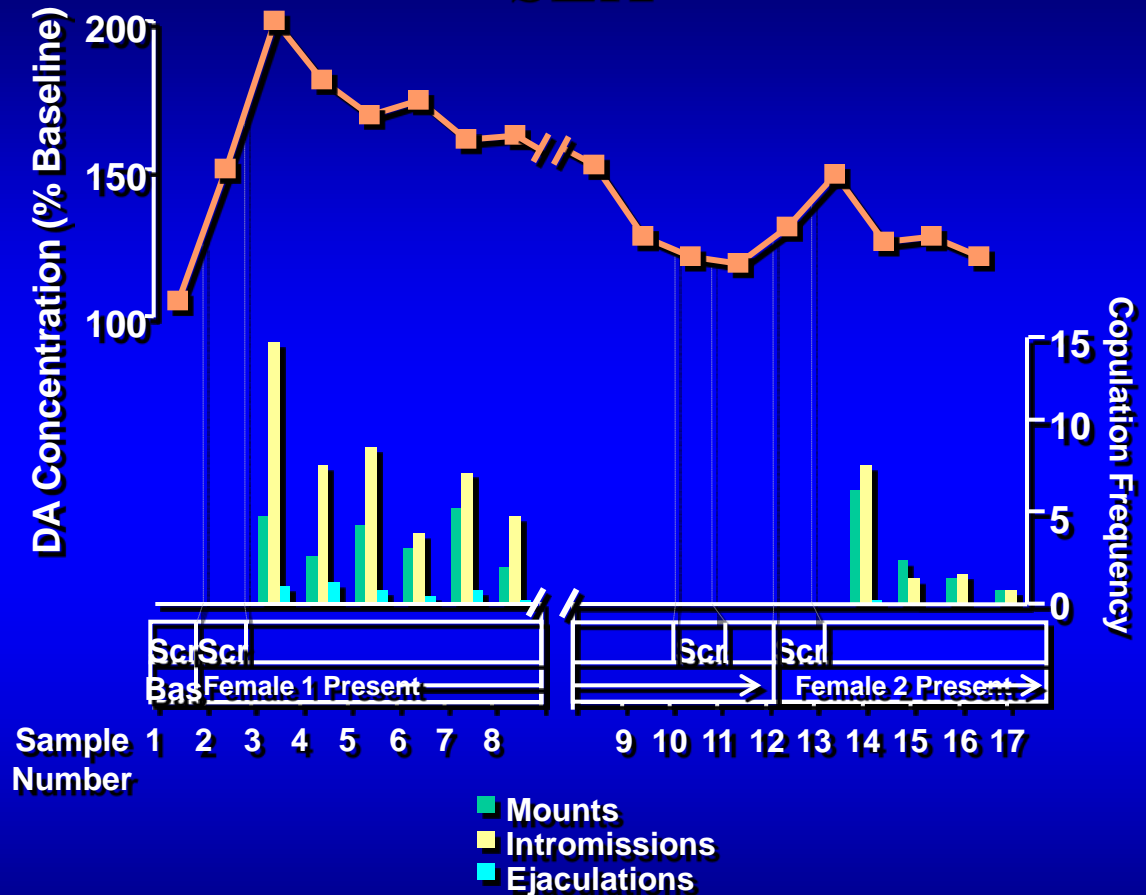
Natural Rewards Elevate Dopamine Levels

FOOD



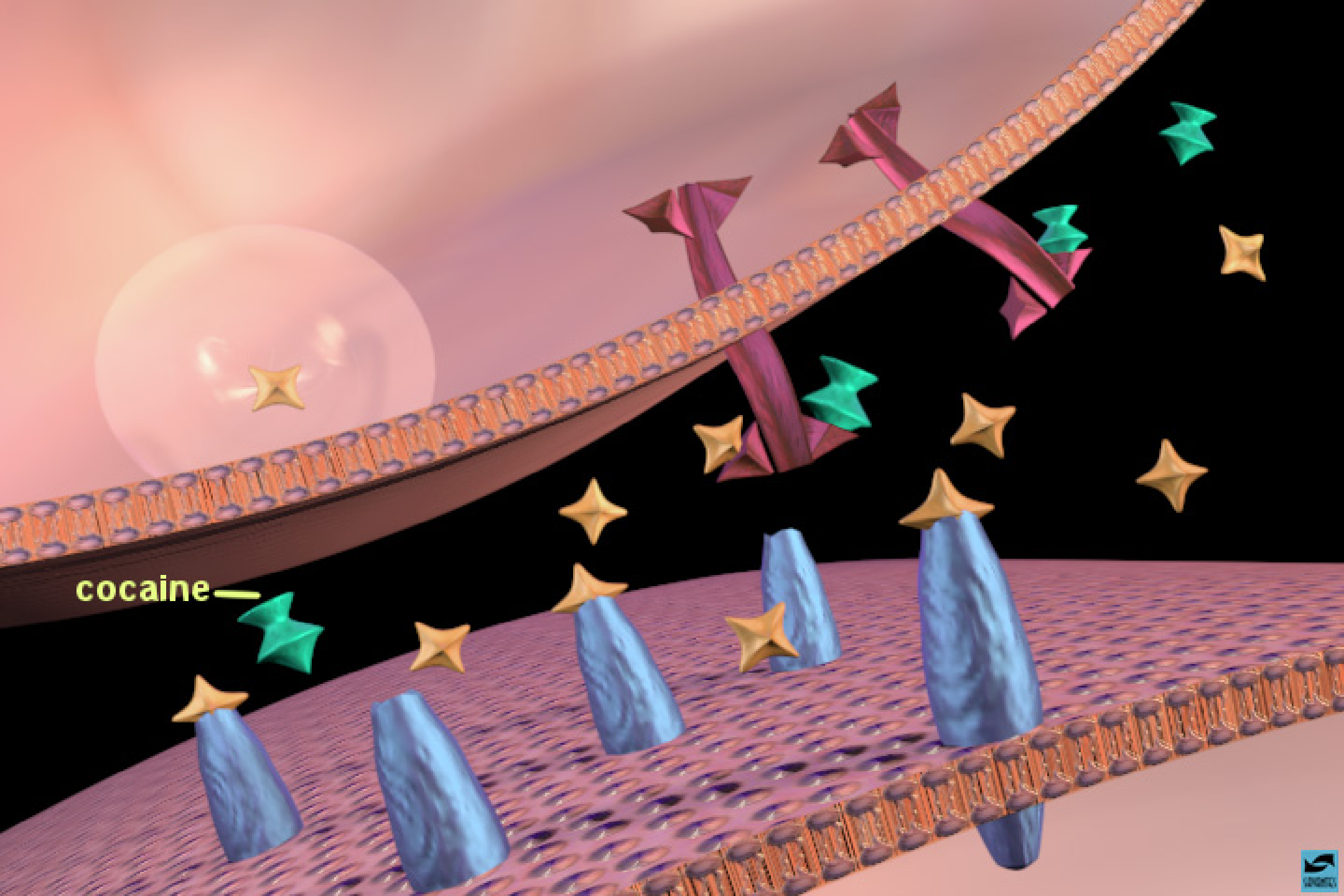
(Di Chiara, Acquas, Tanda, & Cadoni, 1992)

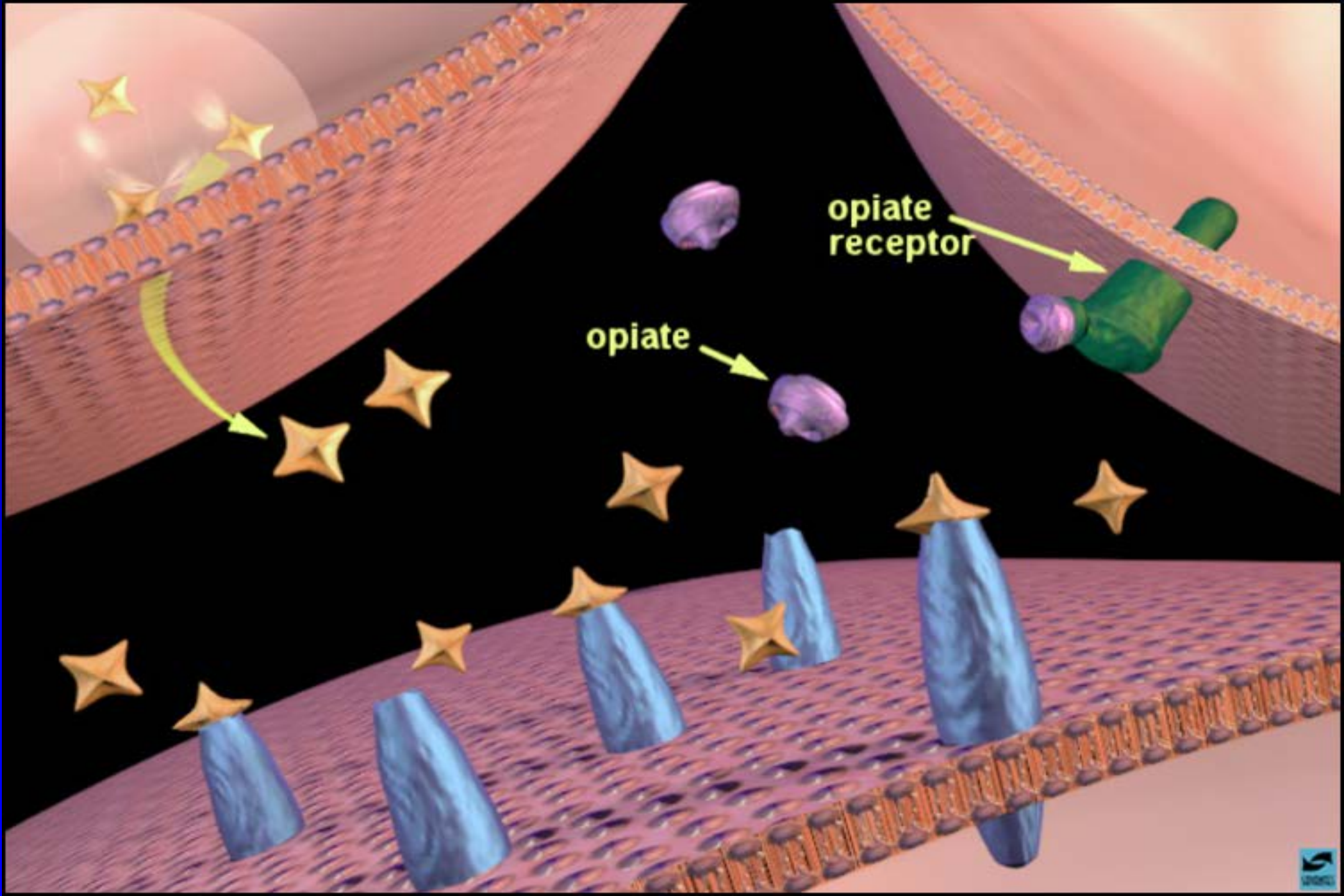
SEX



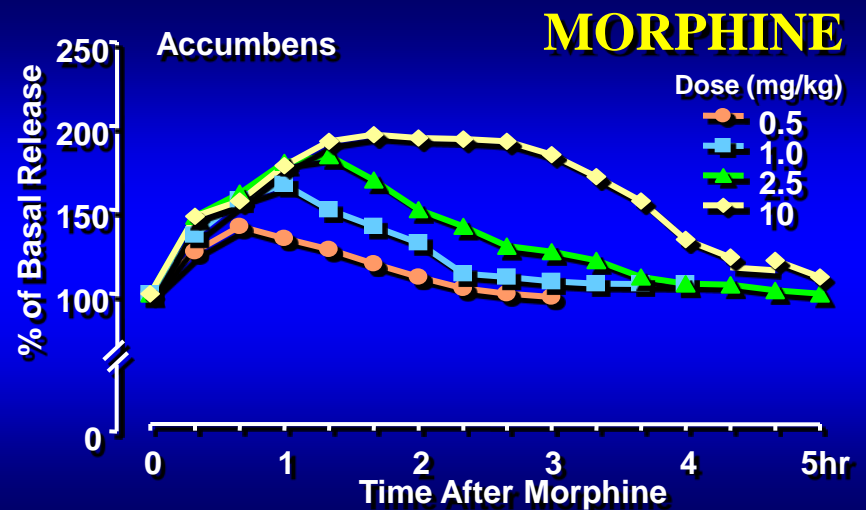
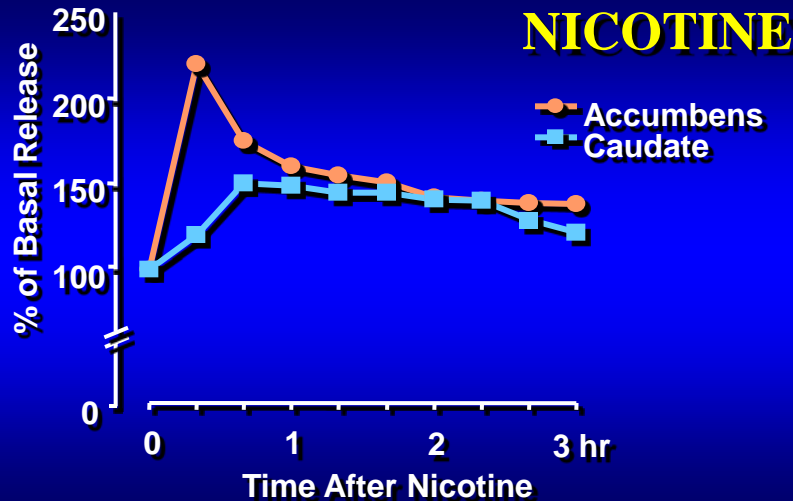
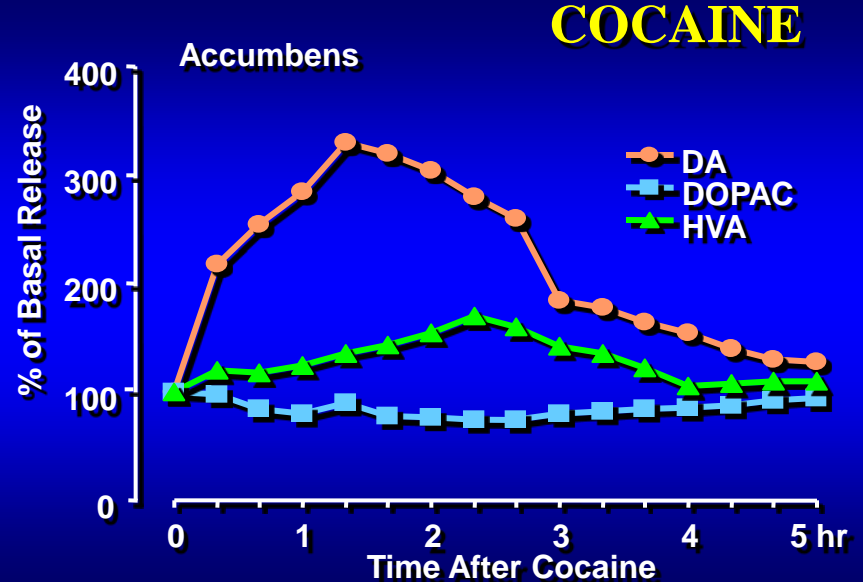
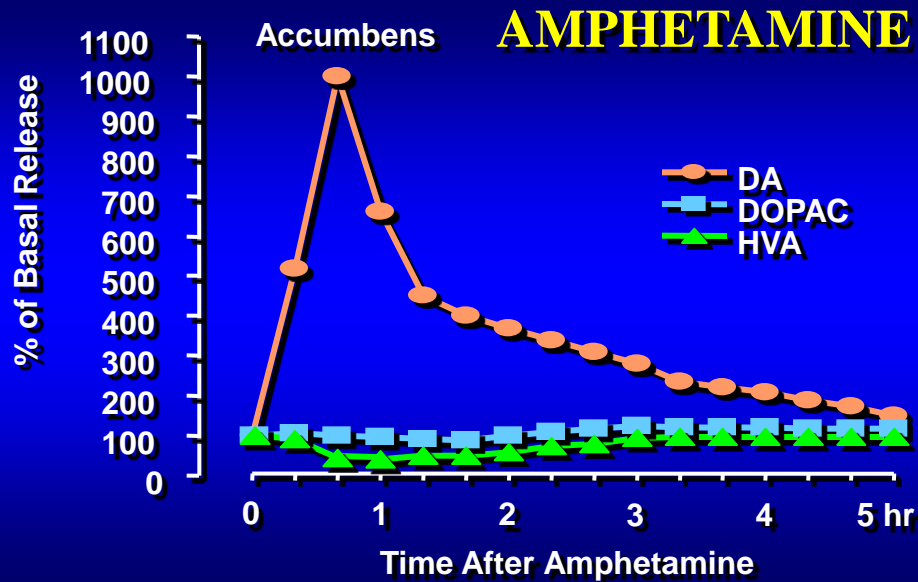
(Fiorino & Phillips, 1999)

cocaine



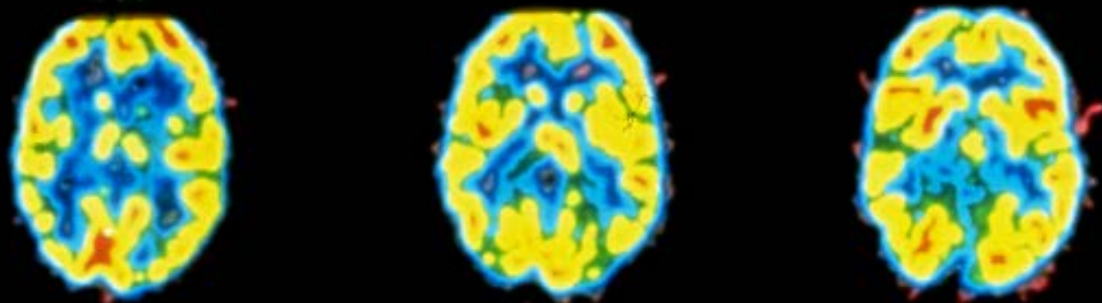


Effects of Drugs on Dopamine Release

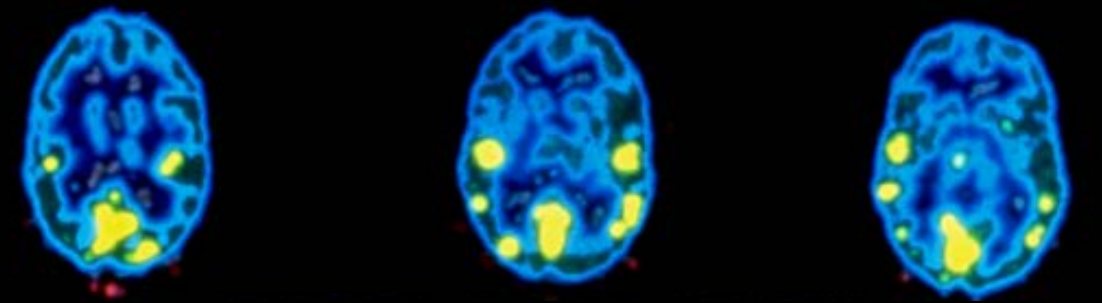


*Science Has Generated A Lot of
Evidence Showing That...*

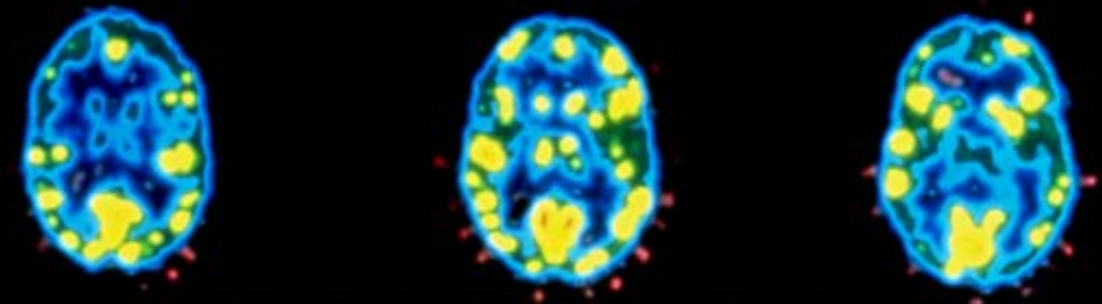
**Prolonged Drug Use Changes
the Brain In Fundamental
and Long-Lasting Ways**



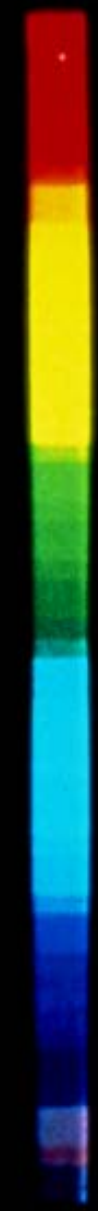
Normal



Cocaine Abuser (10 Days)

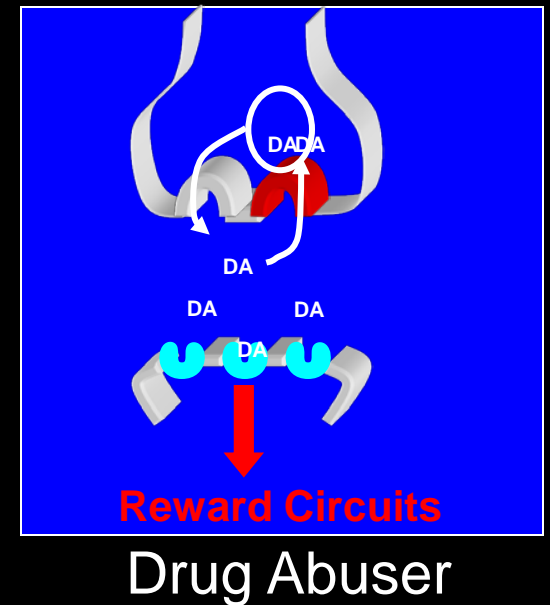
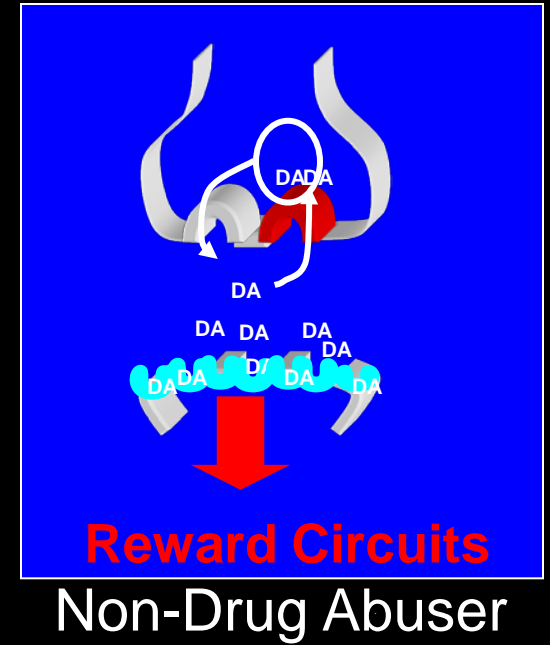
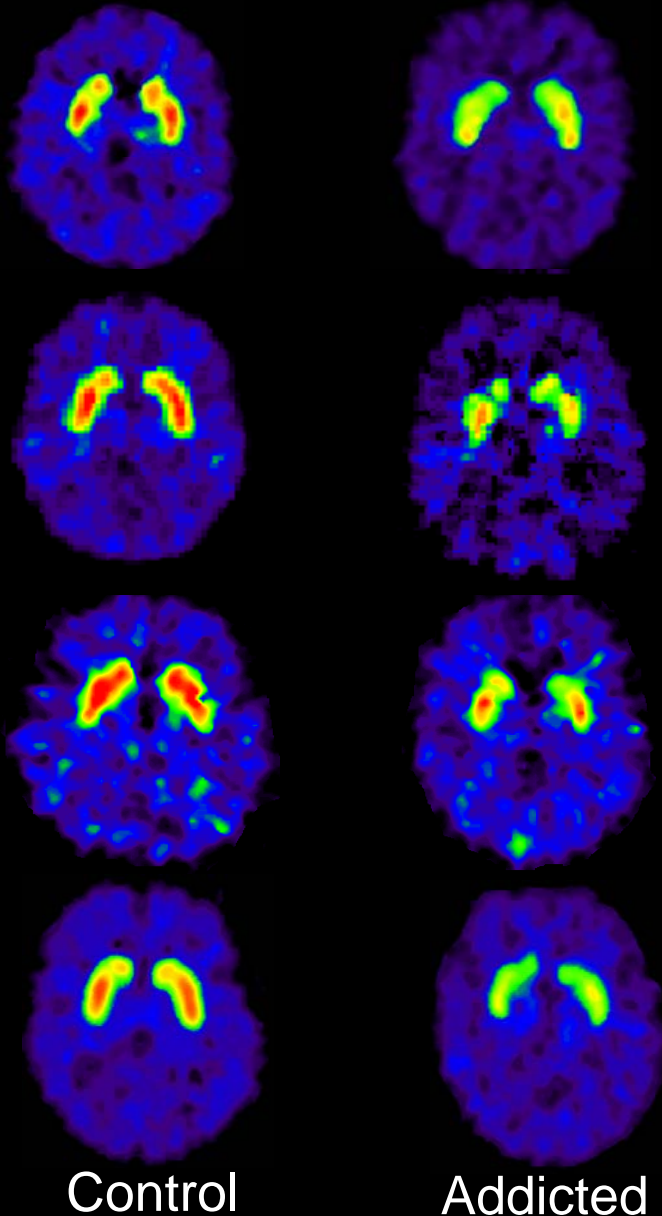
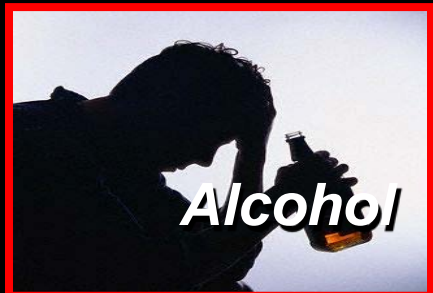


Cocaine Abuser (100 Days)



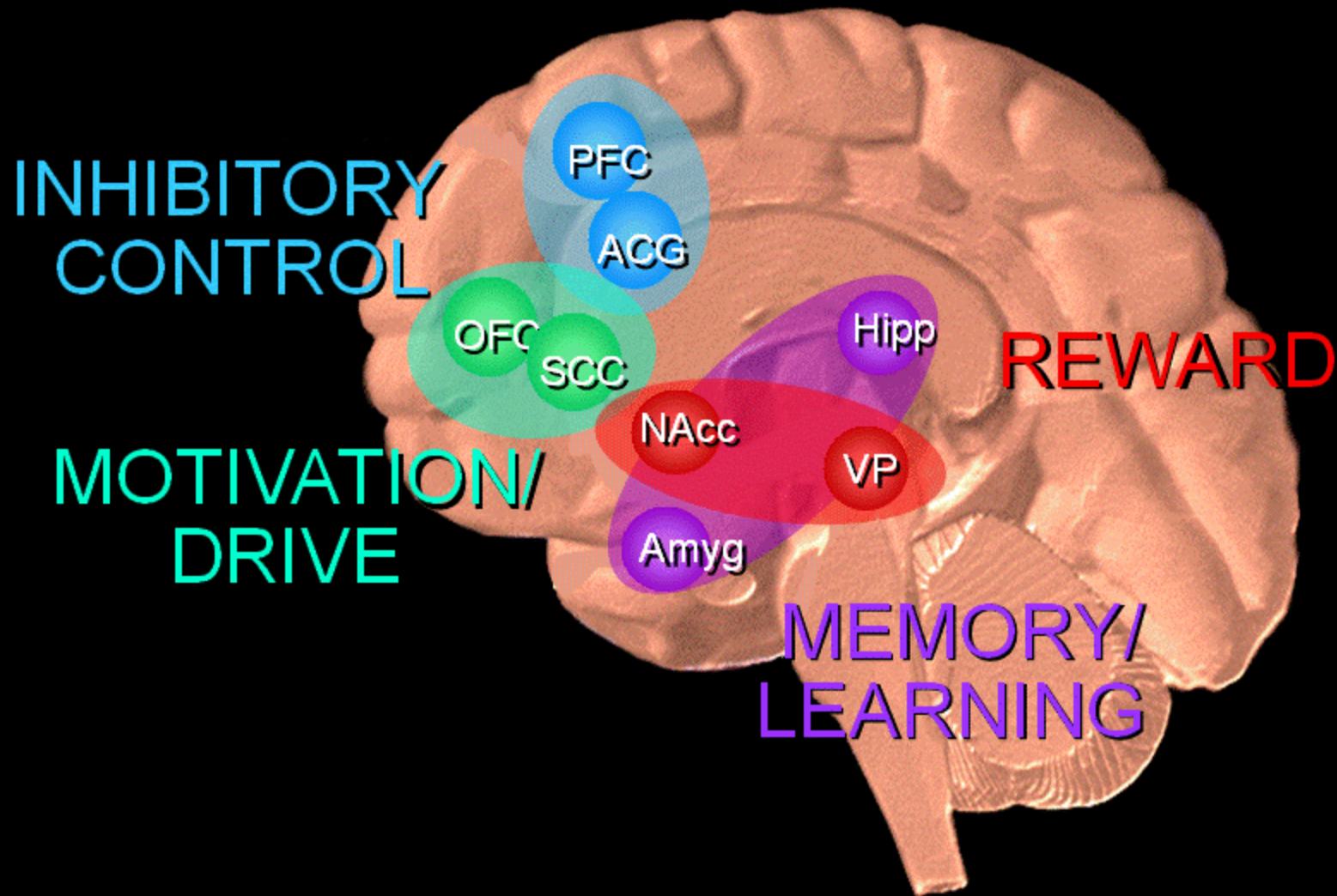
(Volkow et al., 1992; 1993)

Dopamine D2 Receptors are Lower in Addiction



**Prolonged Drug Use Changes
The Brain In Fundamental and
Long-Lasting Ways**

Circuits Involved In Drug Abuse and Addiction



AND...

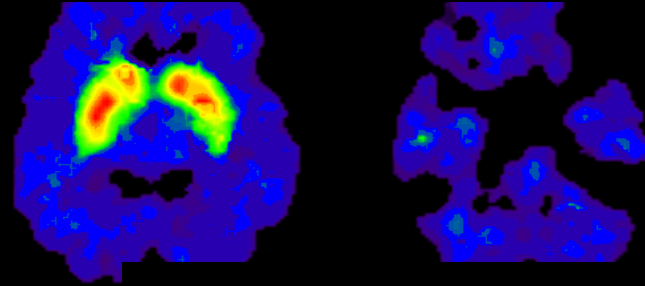
**We Have Evidence that
these Changes Can Be Both
Structural and *Functional***

Implication:

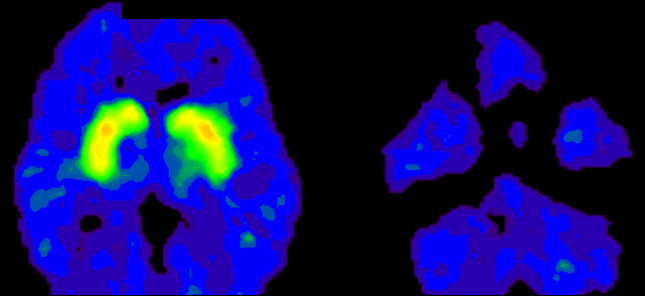
**Brain changes resulting from
prolonged use of drugs
may be reflected in compromised
cognitive functioning**

Is there recovery?

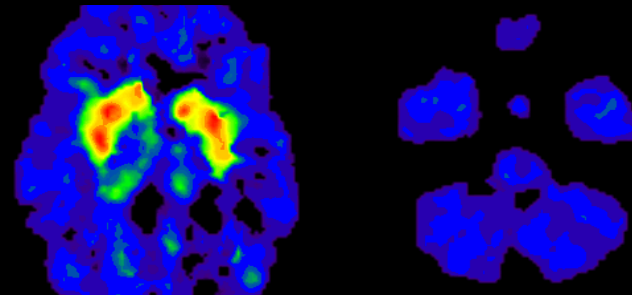
[C-11]d-threo-methylphenidate



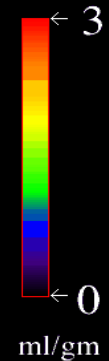
Normal Control



Methamphetamine Abuser
(1 month detoxification)



Methamphetamine Abuser
(14 month abstinent)



**DAT Recovery
with prolonged
abstinence from
methamphetamine**

**As We've Seen, Drug Use Can
Lead to Structural and Functional
Changes in the Brain...**



**Addiction is, Fundamentally, a
Brain Disease**



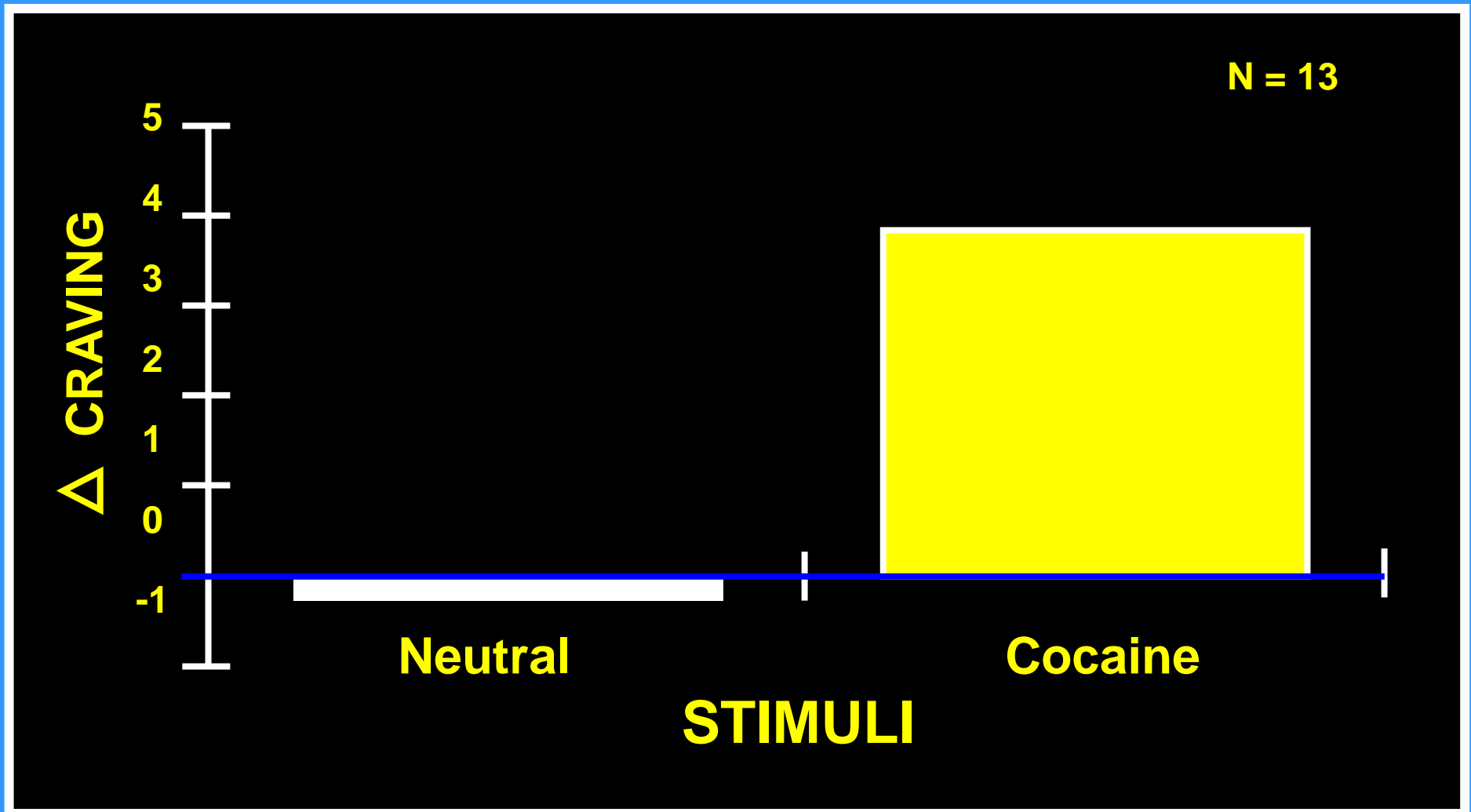
**Addiction is Not
Just a Brain Disease**



**Addiction Is a Brain Disease
Expressed as Compulsive Behavior**

**Both Developing and
Recovering From It Depend on
Behavior and Social Context**

CRAVING INDUCTION IN PET SETTING

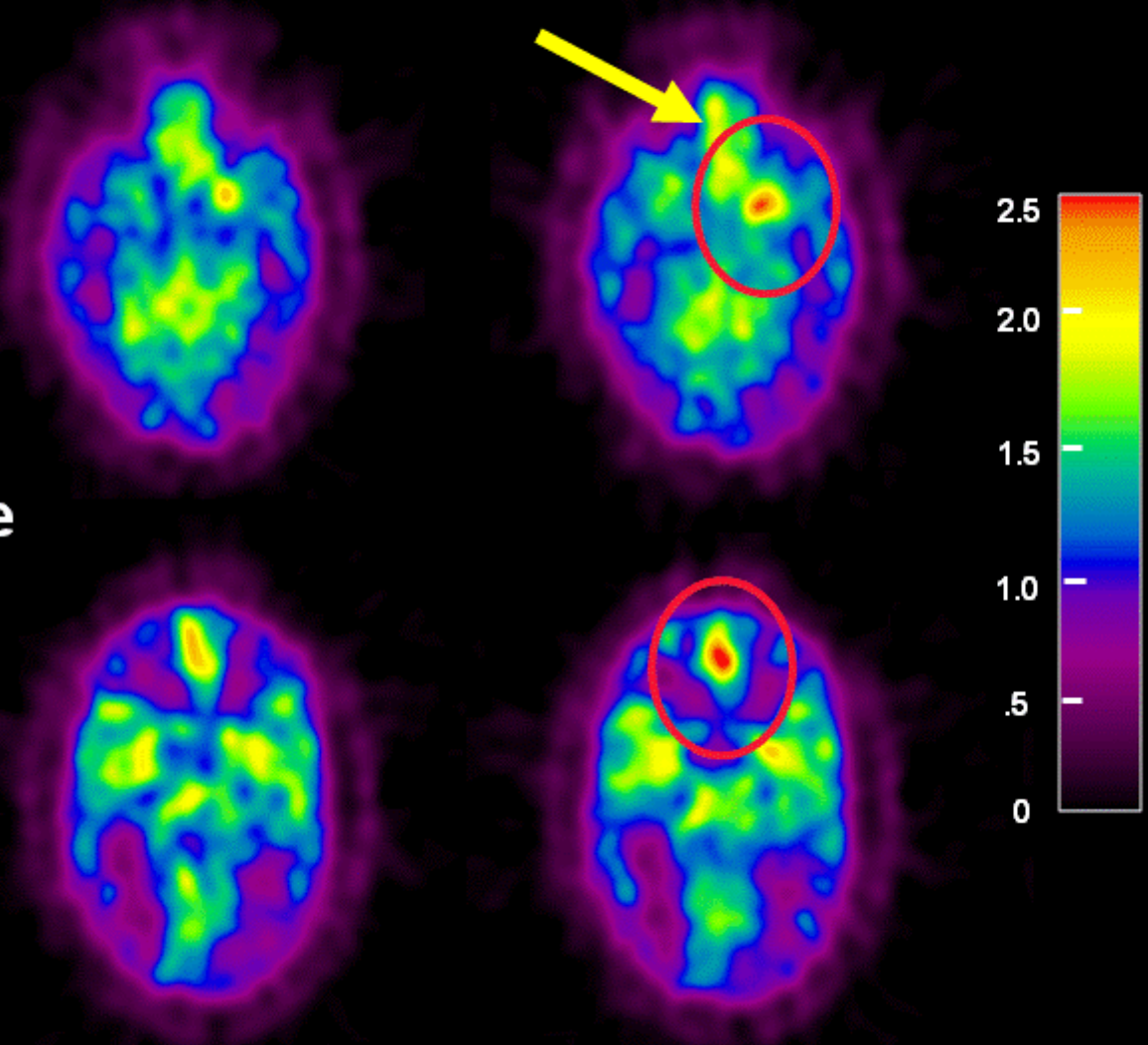
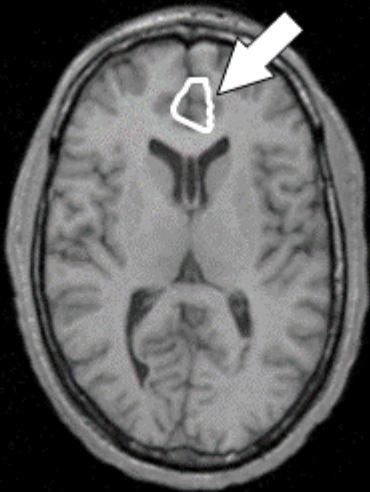


Conditioned Association

Amygdala



Anterior Cingulate



Nature Video

Cocaine Video

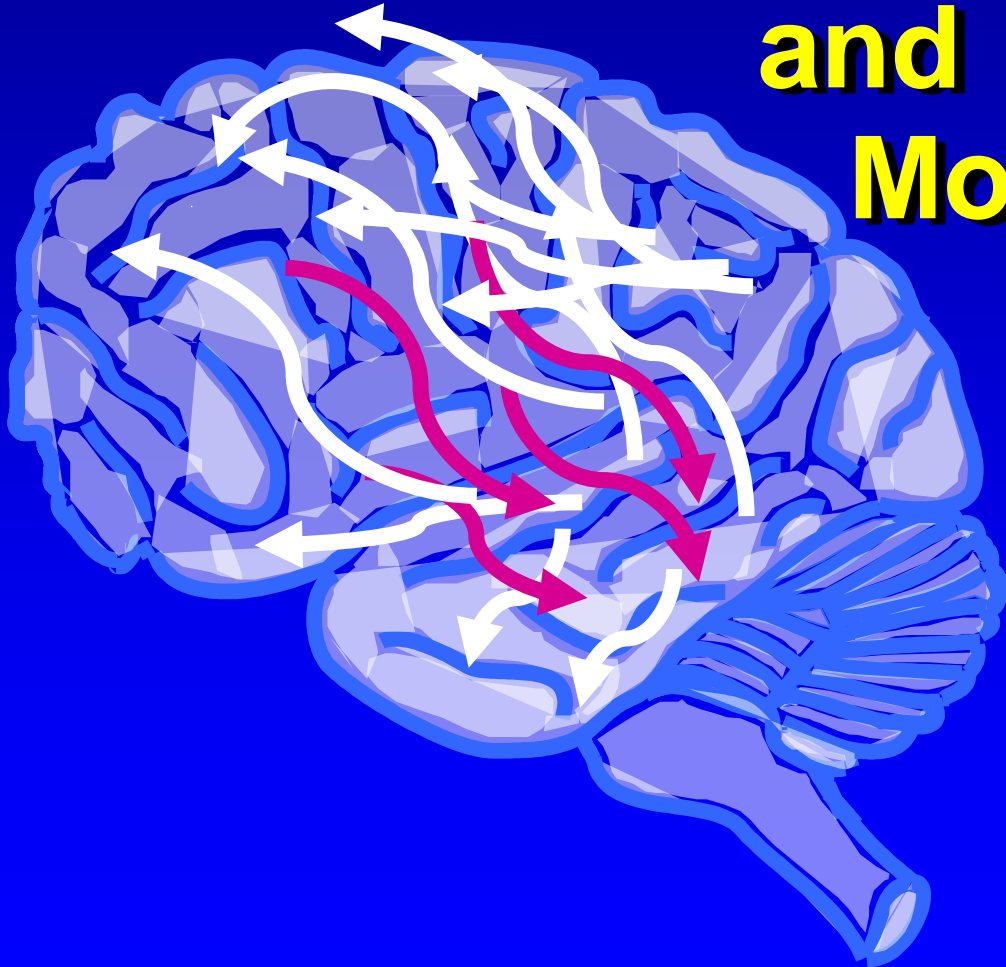
Memories Appear to Be a Critical Part of Addiction

“People, Places and Things...”

But Not Just Memories...

**Drugs Are Usurping
Brain Circuits
and**

Motivational Priorities



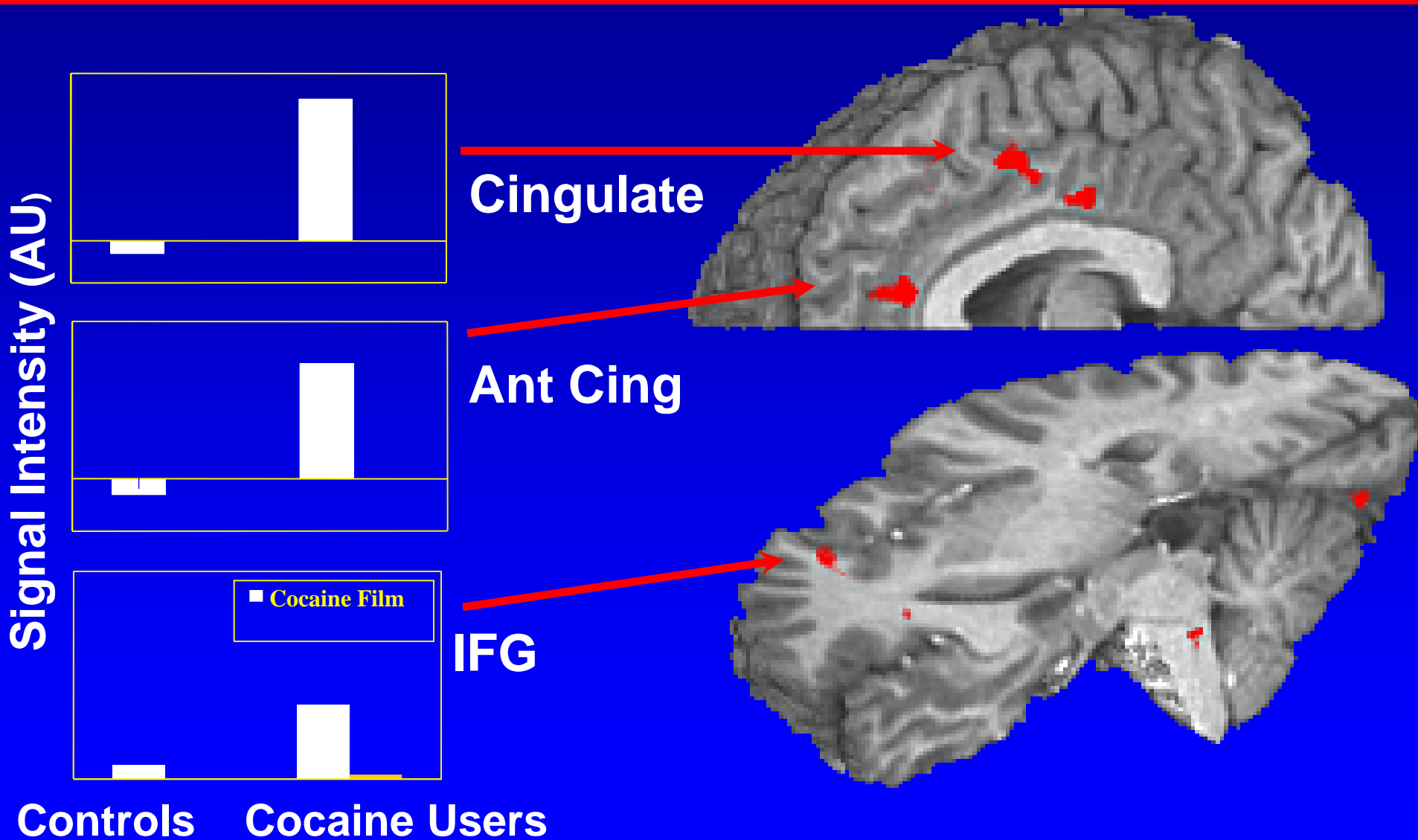
We Don't Know the Exact Switch

BUT...

**We Do Know that the Brain
Circuitry Involved in Addiction
Has Similarities to that of
Other Motivational Systems**

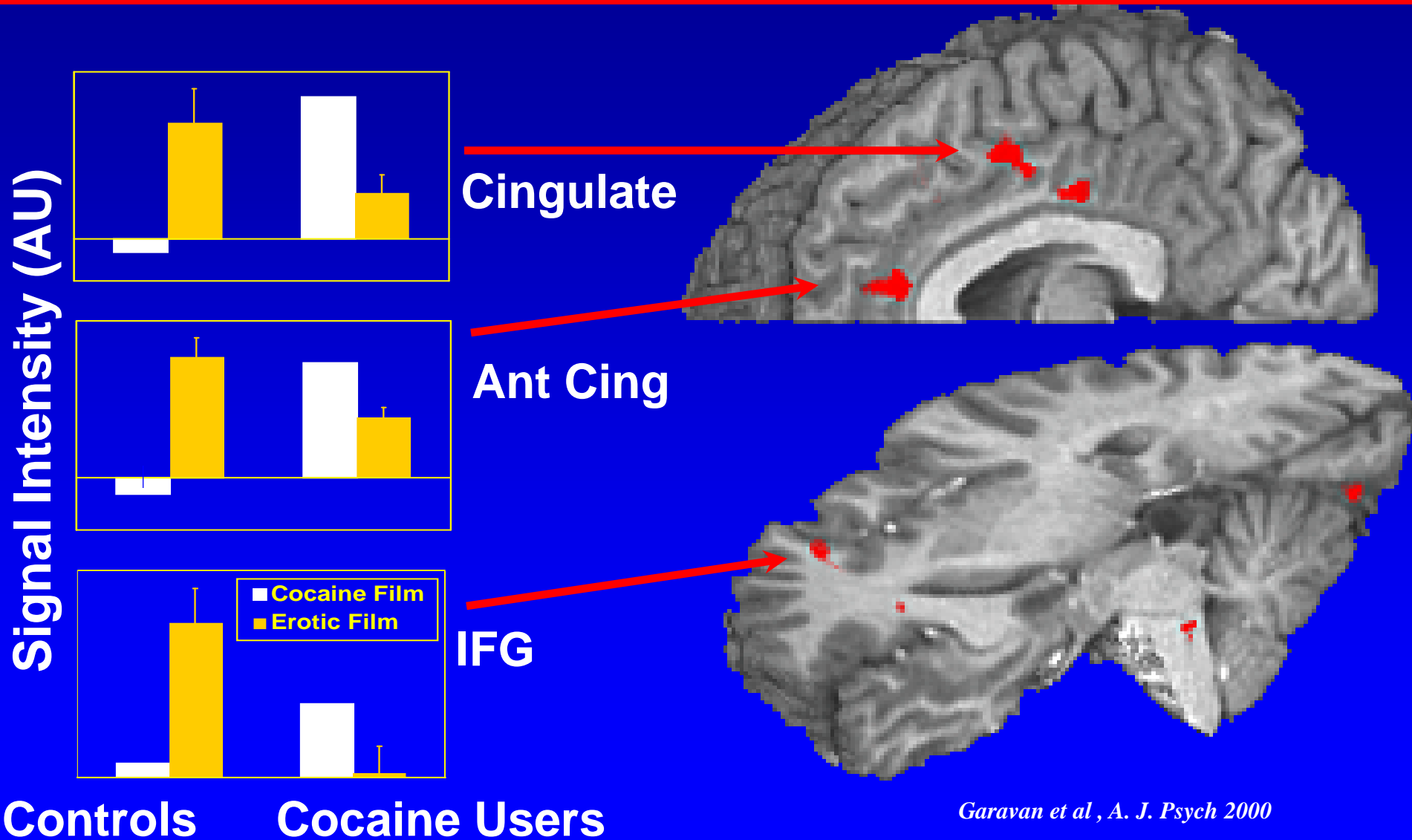
Cocaine Craving:

Population (Cocaine Users, Controls) x Film (cocaine)



Cocaine Craving:

Population (Cocaine Users, Controls) x Film (cocaine, erotic)



**This Results in
“Motivational Toxicity”
and Compulsive Drug
Use (Addiction)**

Because...

Their *Brains*



have been

Re-Wired

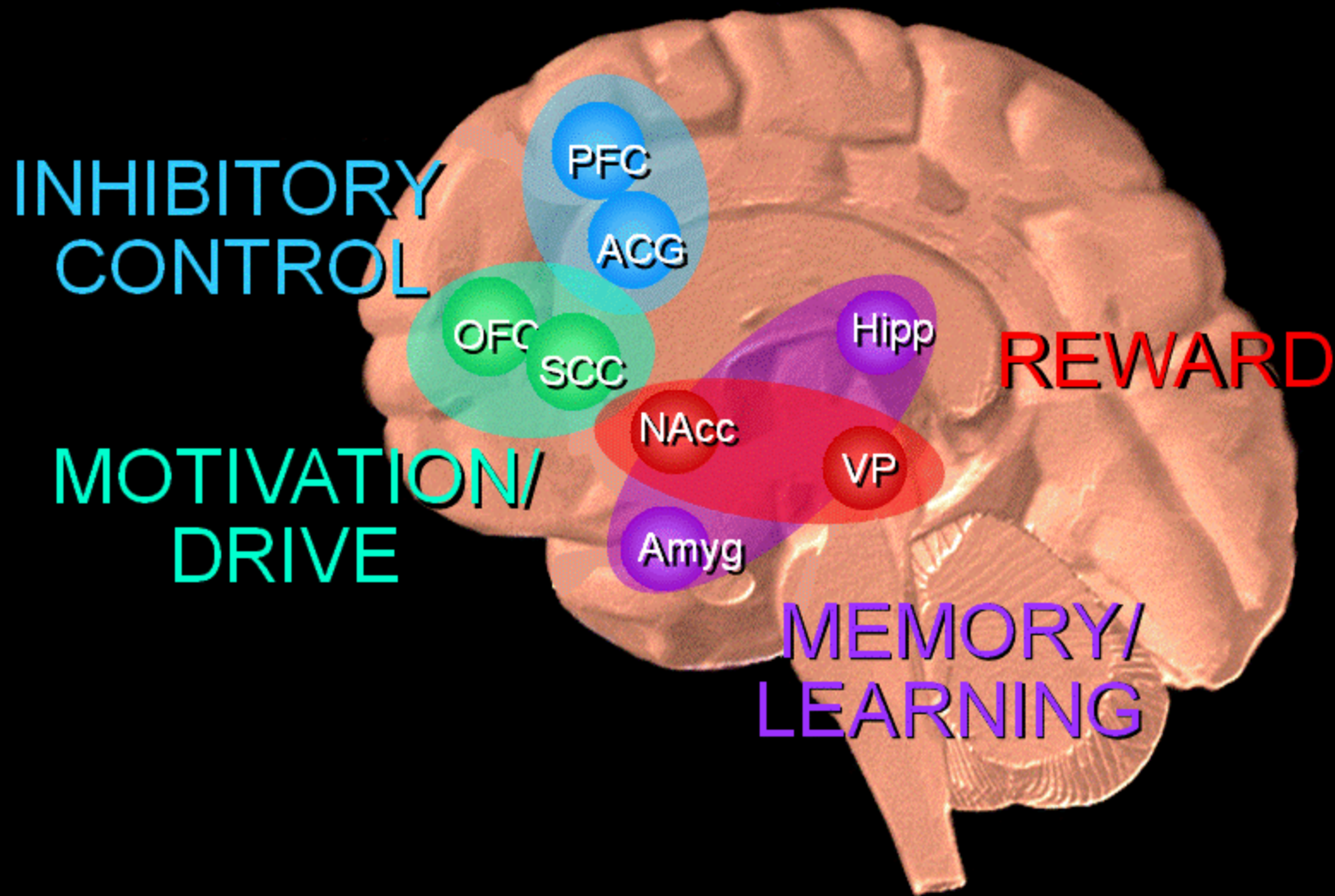
by *Drug Use*

**Addiction is the
Quintessential
Biobehavioral Disorder**

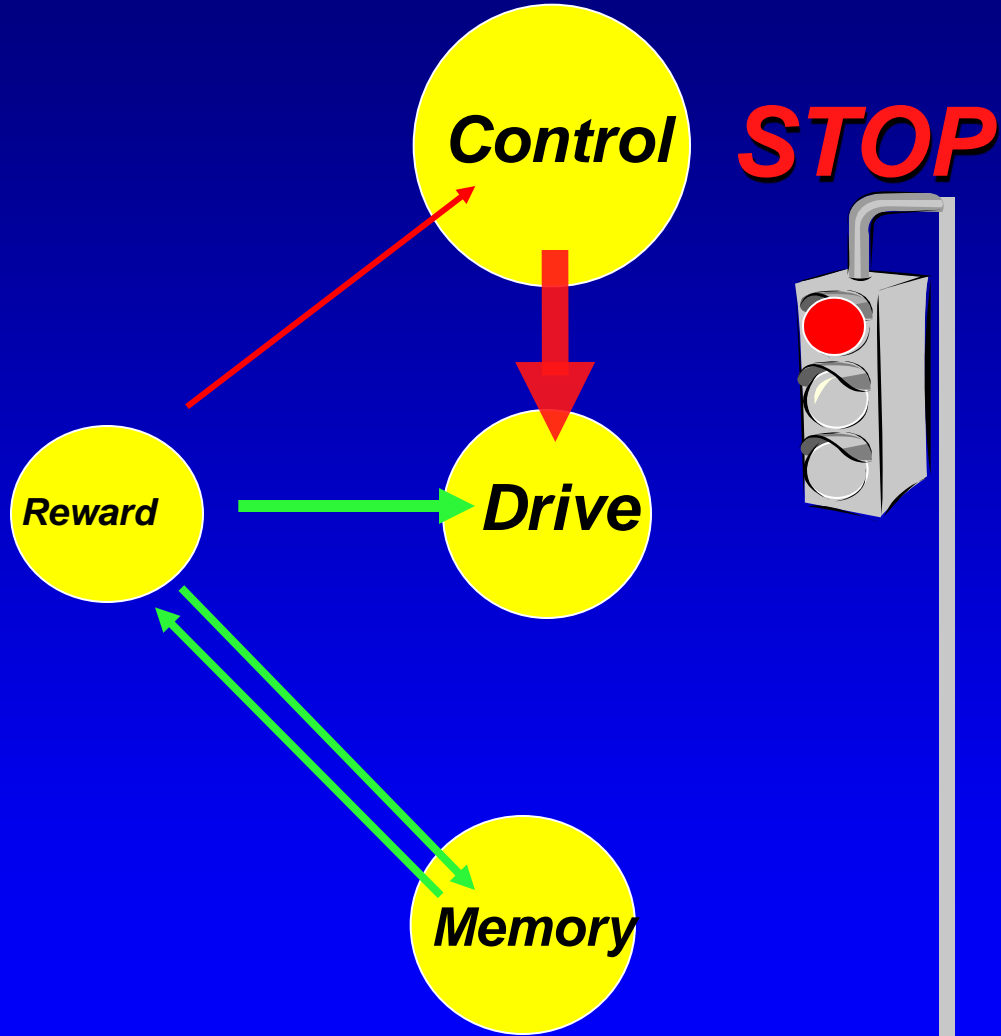
**The Brains of Addicts
Are Different From
the Brains of Non-Addicts**

**...And Those Differences
Are An Essential Element
of Addiction**

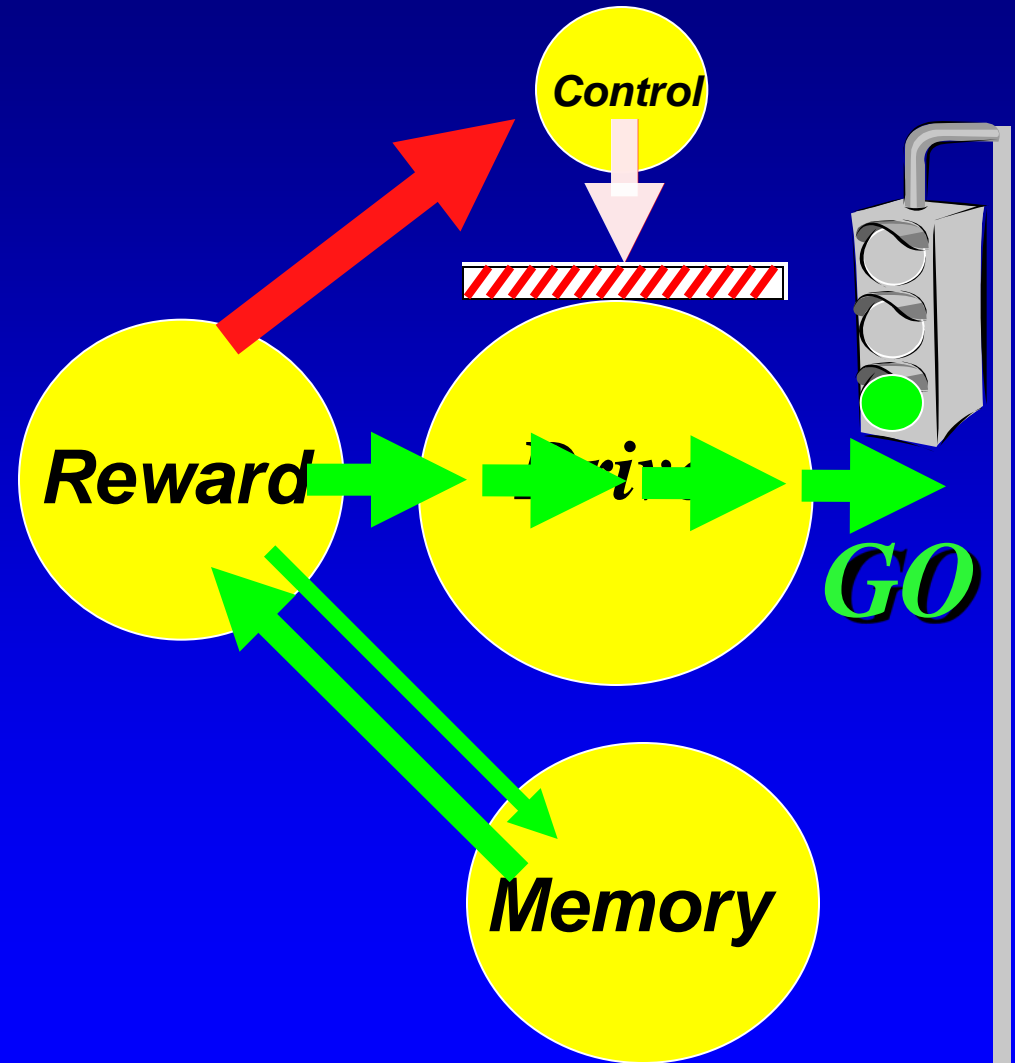
Circuits Involved In Drug Abuse and Addiction



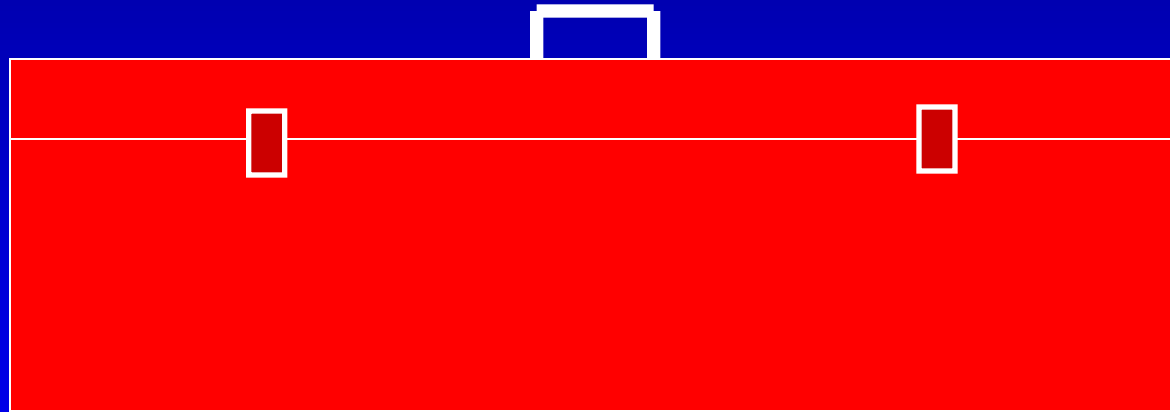
Non Addicted Brain



Addicted Brain



***We Have a Variety of Effective
Treatment Options in the
Clinical Toolbox***



Available Pharmacotherapies

Opiates

- Methadone
 - Naltrexone
 - Buprenorphine
 - Buprenorphine/
Naloxone
- Depot Naltrexone
(Vivitrol)

Nicotine

- *Bupropion*
- *NRT*
- *Varenicline*

Alcohol

- *Disulfiram*
- *Oral Naltrexone*
- *Injectible extended
release naltrexone:
Vivitrol*
- *Acamprosate*

Alcohol Withdrawal

- *Valium*
- *Librium*
- *Tranxene*

Some Efficacious Behavioral Treatments For Drug Dependence

- ***Cognitive Behavioral Therapy***
- ***Community Reinforcement Approach (CRA) with Vouchers***
- ***Contingency Management (Without CRA)***
- ***Lower-cost Contingency Management***
- ***Brief Strategic Family Therapy***
- ***Multidimensional Family Therapy***
- ***Behavioral Couples Therapy***
- ***Motivational Interviewing / Motivational Enhancement Therapy***

**Treating a Biobehavioral
Disorder Must Go beyond just
Fixing the Chemistry**

The Most Effective Treatment Strategies Will Attend to all Aspects of Addiction:

- **Biology**
- **Behavior**
- **Social Context**

The Acute Care Treatment Model

Substance Abusing Patient



```
graph TD; A[Substance Abusing Patient] --> B[Treatment]; B --> C[Non-Substance Abusing Patient]
```

The diagram illustrates the Acute Care Treatment Model. It begins with a box labeled 'Substance Abusing Patient' at the top. A downward arrow points to a central orange box labeled 'Treatment'. A second downward arrow points from the 'Treatment' box to a final box at the bottom labeled 'Non-Substance Abusing Patient'.

Treatment

Non- Substance Abusing Patient

A Continuing Care Model

Primary Care



```
graph TD; A[Primary Care] --> B[Specialty Care]; B --> C[Primary Continuing Care];
```

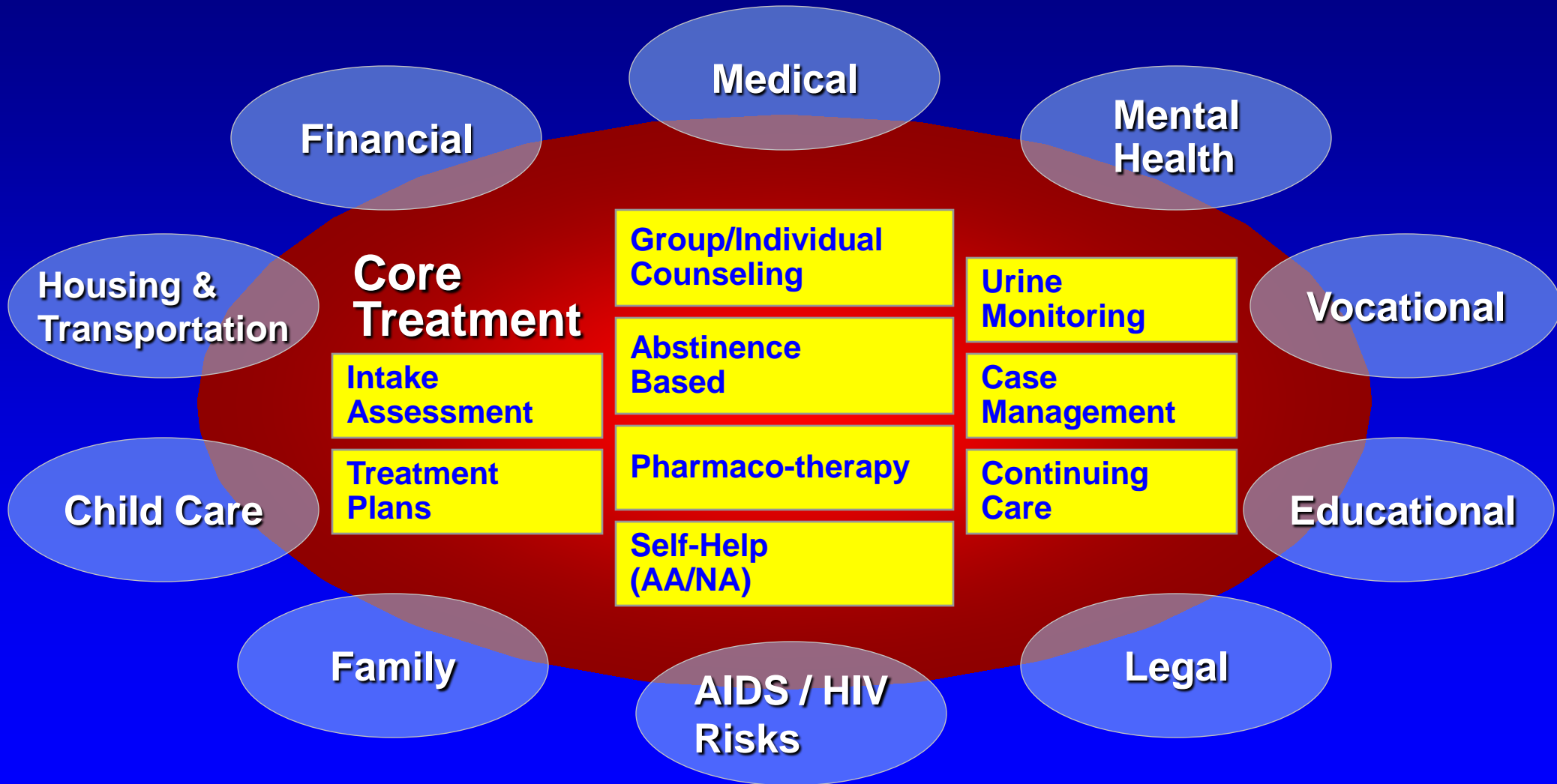
Specialty Care

*Primary
Continuing Care*

Detox is NOT Treatment

Detox is NOT Treatment
It is a part of treatment

Drug Abuse Treatment Core Components and Comprehensive Services

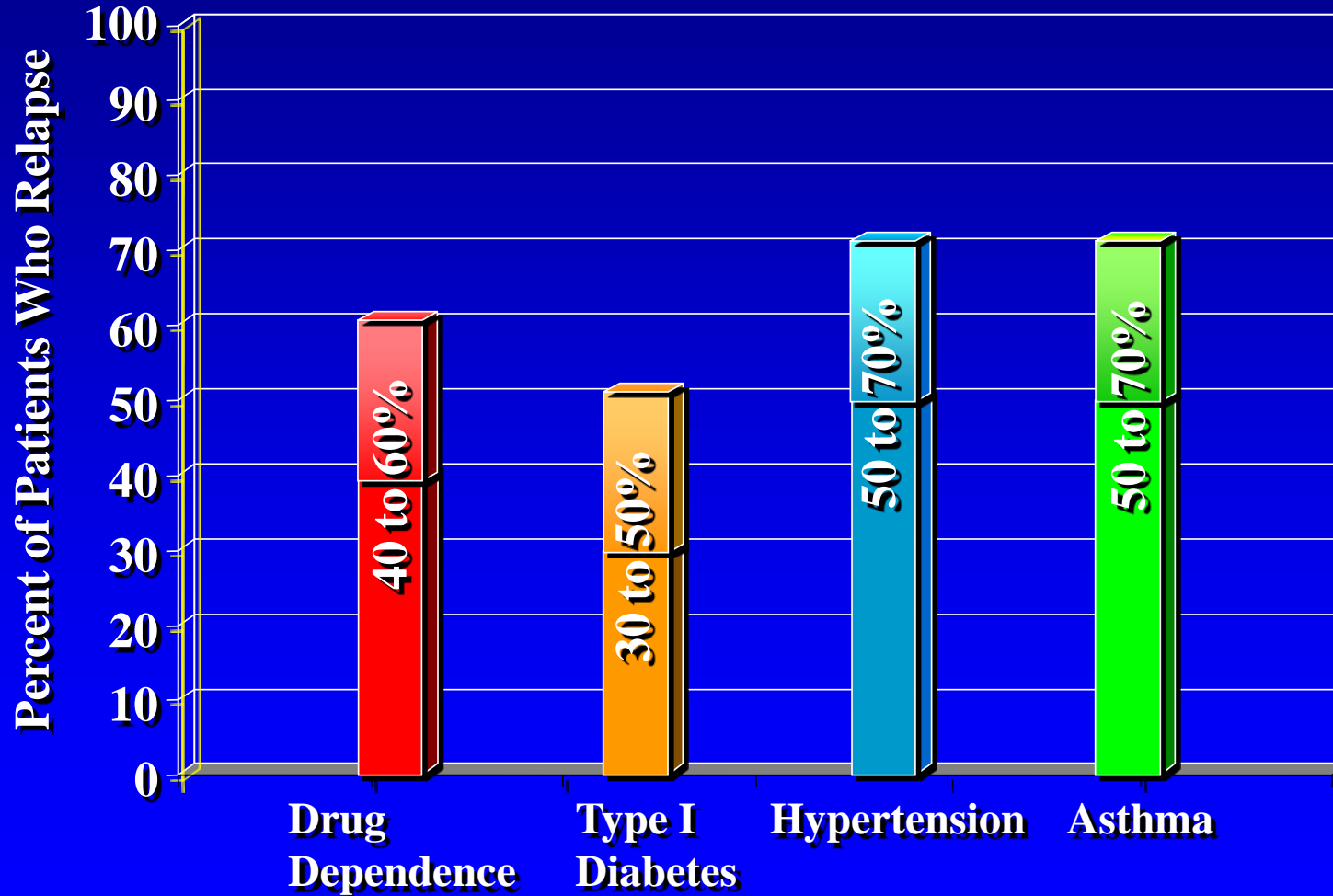


***We Need to Treat the
Whole Person!***



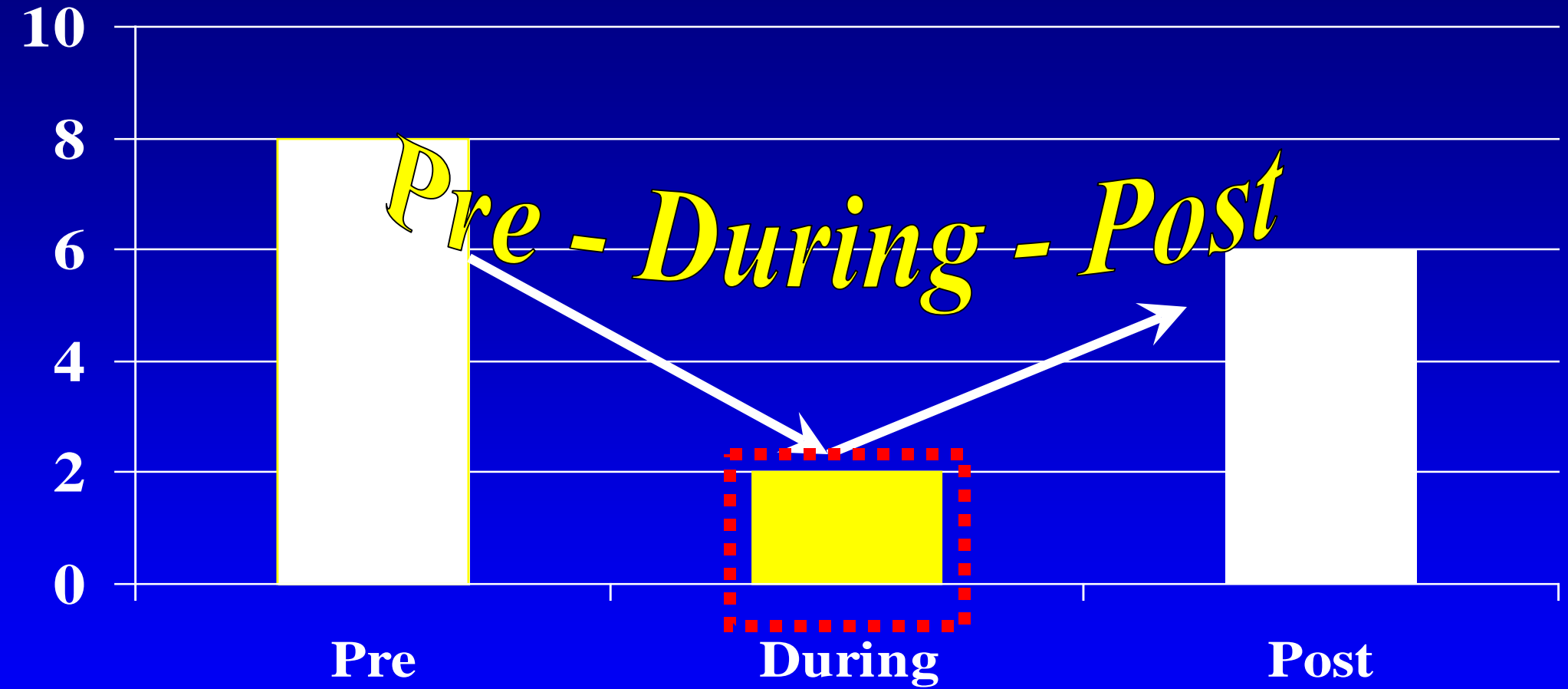
***We Need to View and
Treat Addiction as a
Chronic, Relapsing Illness***

Relapse Rates Are Similar for Drug Dependence and Other Chronic Illnesses

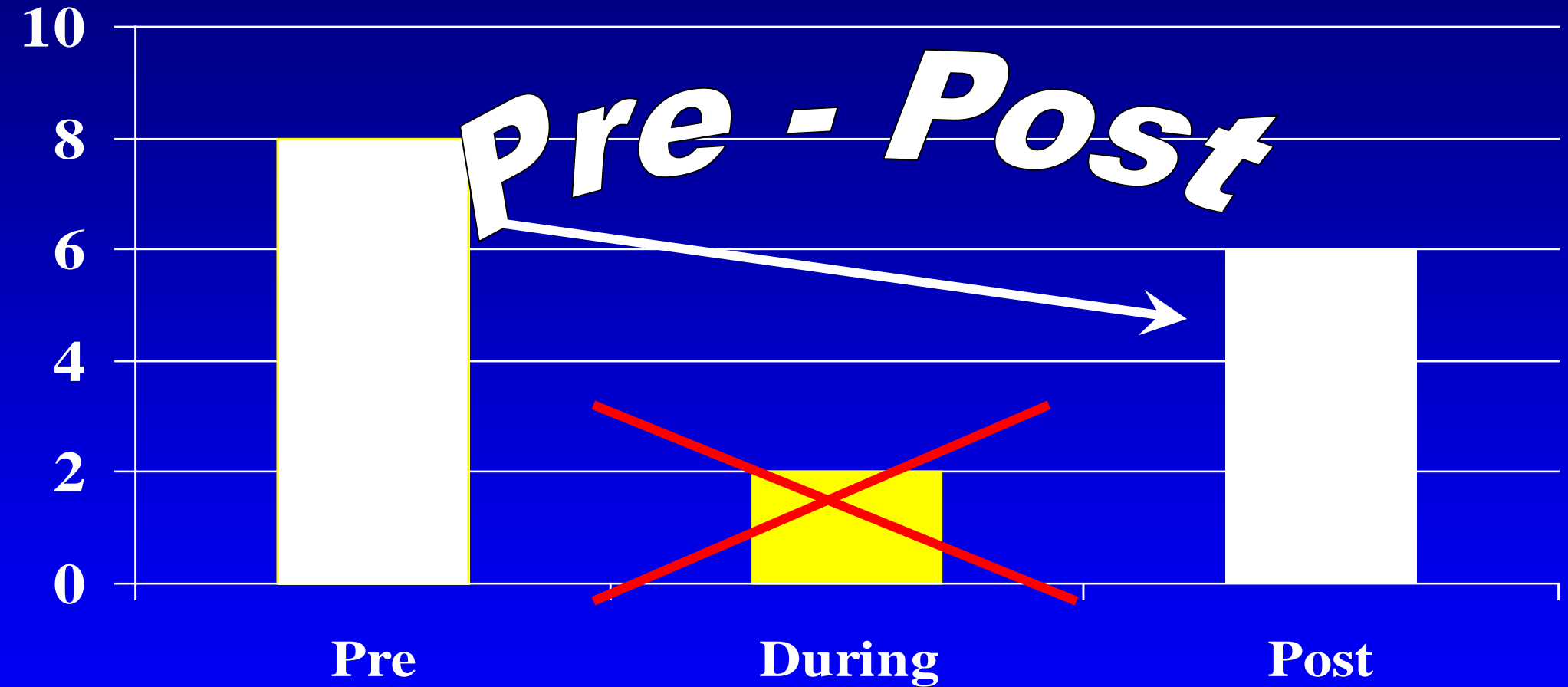


Source: McLellan, A.T. et al., JAMA, Vol 284(13), October 4, 2000.

Outcome In Diabetes



Outcome In Addiction



If we treat a diabetic and symptoms don't subside....what do we do?

Would we increase the dose?

Would we change medications?

Would we change treatment approaches?

Would we fail to provide ongoing treatment for a diabetic?

A Continuing Care Model

Primary Care



```
graph TD; A[Primary Care] --> B[Specialty Care]; B --> C[Primary Continuing Care];
```

Specialty Care

*Primary
Continuing Care*

In Treating Addiction...

*We Need to Keep Our Eye on
the Real Target*



Ineffective System for Addressing Drugs and Crime

Public Health Approach
-disease
-treatment

High Attrition

Public Safety Approach
-illegal behavior
-punish

High Recidivism

Integrated Public Health-Public Safety Strategy

Community-based treatment

Close supervision

Blends functions of criminal justice and treatment systems to optimize outcomes

Opportunity to avoid incarceration or criminal record

Consequences for noncompliance are certain and immediate

Where do we go from here?

- *Provide upfront alternative to incarceration for individuals with SUDs*
- *Provide treatment while incarcerated for individuals with SUDs*
- *Embrace all forms of treatment including medication assisted treatment (MAT)*
- *Treat addiction as the chronic disease that it is!*
 - *Expand enrollment of CJ populations in care*

**So....Advances in Science
Have Revolutionized Our
Fundamental Views of
Substance Abuse and
Addiction**

***And these advances have
the potential to help
improve both the***



CRIMINAL JUSTICE

and

HEALTH

***Approaches to Addressing
Drug Abuse and Addiction***

- 
- *Reduce Crime*
 - *Save Money*
 - *Improve Lives*

Treatment
is the Key
drugabuse.gov

A sunset or sunrise scene with a bare tree silhouette on the right and mountains in the distance. The sky is filled with vibrant orange and yellow hues, transitioning to a darker purple at the top. The tree's branches are dark and intricate against the bright sky. The mountains in the background are silhouetted against the horizon.

A New Day is here for the field of addictions

Thank you for what you do!

Thank You

Tcondon@unm.edu



*Center on Alcoholism, Substance Abuse &
Addictions*