

FRIENDS OF  
**RECOVERY**  
New York

ONE COMMUNITY  
ONE VOICE



The  
Science of

Addiction

& Recovery

FACES & VOICES  
OF RECOVERY



# FOR-NY and Faces & Voices of Recovery



Today's training is brought to you through a collaboration between:

## ***Facilitators:***

*Judy Moffitt*

*Jenn Wood*



FOR-NY is a member of the Association of Recovery Community Organizations (ARCO)

# Our Training Goals

- 1) Learn the message of the neurobiology of addiction and recovery.
- 2) Understand why it's important for recovery advocacy and the recovery community

# What is recovery?

- Talking about recovery
  - Faces & Voices' messaging
- Defining recovery
  - US Substance Abuse and Mental Health Services Administration (SAMHSA) Center for Substance Abuse Treatment (CSAT) National Summit on Recovery, 2005
  - Betty Ford Institute Consensus Panel, 2007

<https://www.youtube.com/watch?v=sXIy6KmE9IE>



# Why are we talking about neuroscience?

- Understand Addiction
- Understand Recovery

*How the brain behaves in health and disease may well be the most important question in our lifetime.*

*Richard D. Broadwell, 1995*

***Historically  
speaking...***

**this is your brain on drugs.**

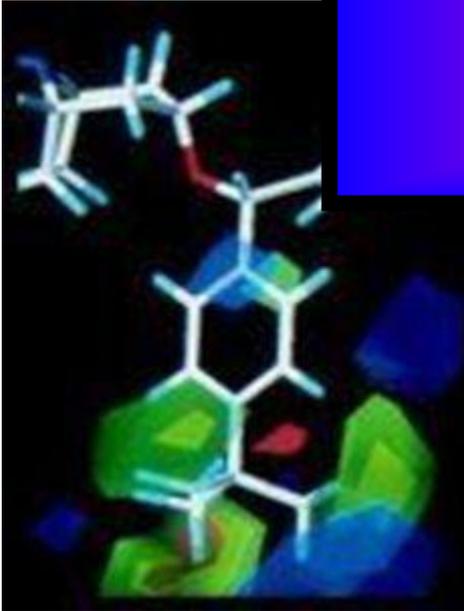
***Your Brain  
on Drugs in  
the 1980's.***





*Bringing the  
Full Power of Science  
to Bear on*

**Drug Abuse  
& Addiction**

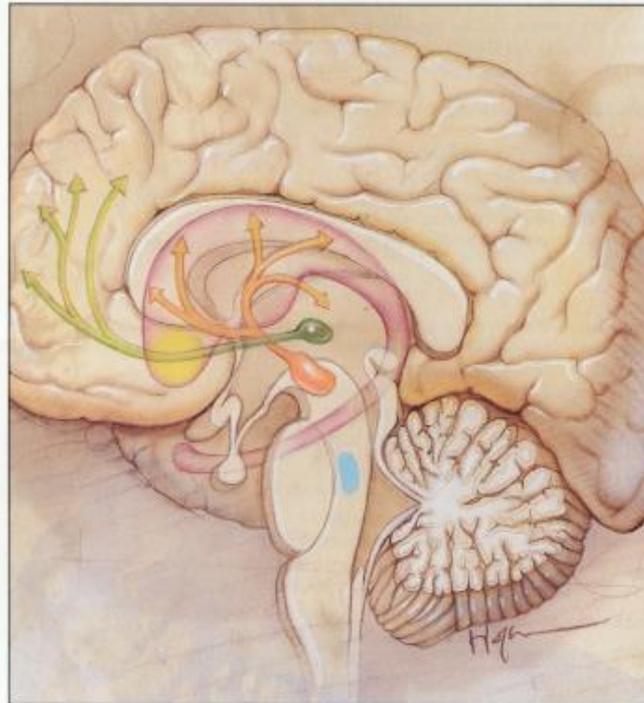


# A SPECIAL REPORT

A Publication of The McGraw-Hill Companies, Inc.

APRIL 1997

## NEW UNDERSTANDING OF DRUG ADDICTION



COSPONSORED BY THE NATIONAL INSTITUTE ON DRUG ABUSE  
AND HOSPITAL PRACTICE



The  
Science of  
Addiction  
& Recovery

FACES & VOICES  
OF RECOVERY

U.S. Department of Justice  
Office of Justice Programs  
National Institute of Justice



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# National Institute of Justice

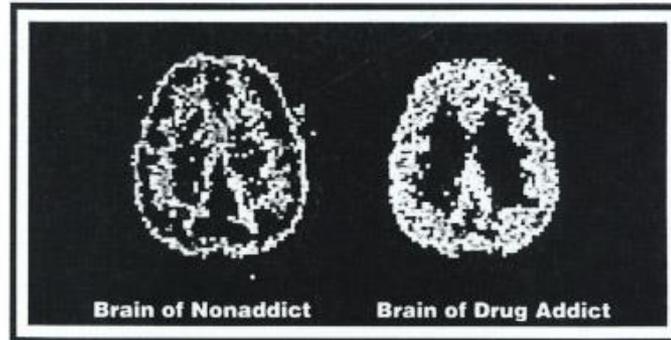
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## **JOURNAL**

October 1998

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### ADDICTION IS A BRAIN DISEASE— AND IT MATTERS



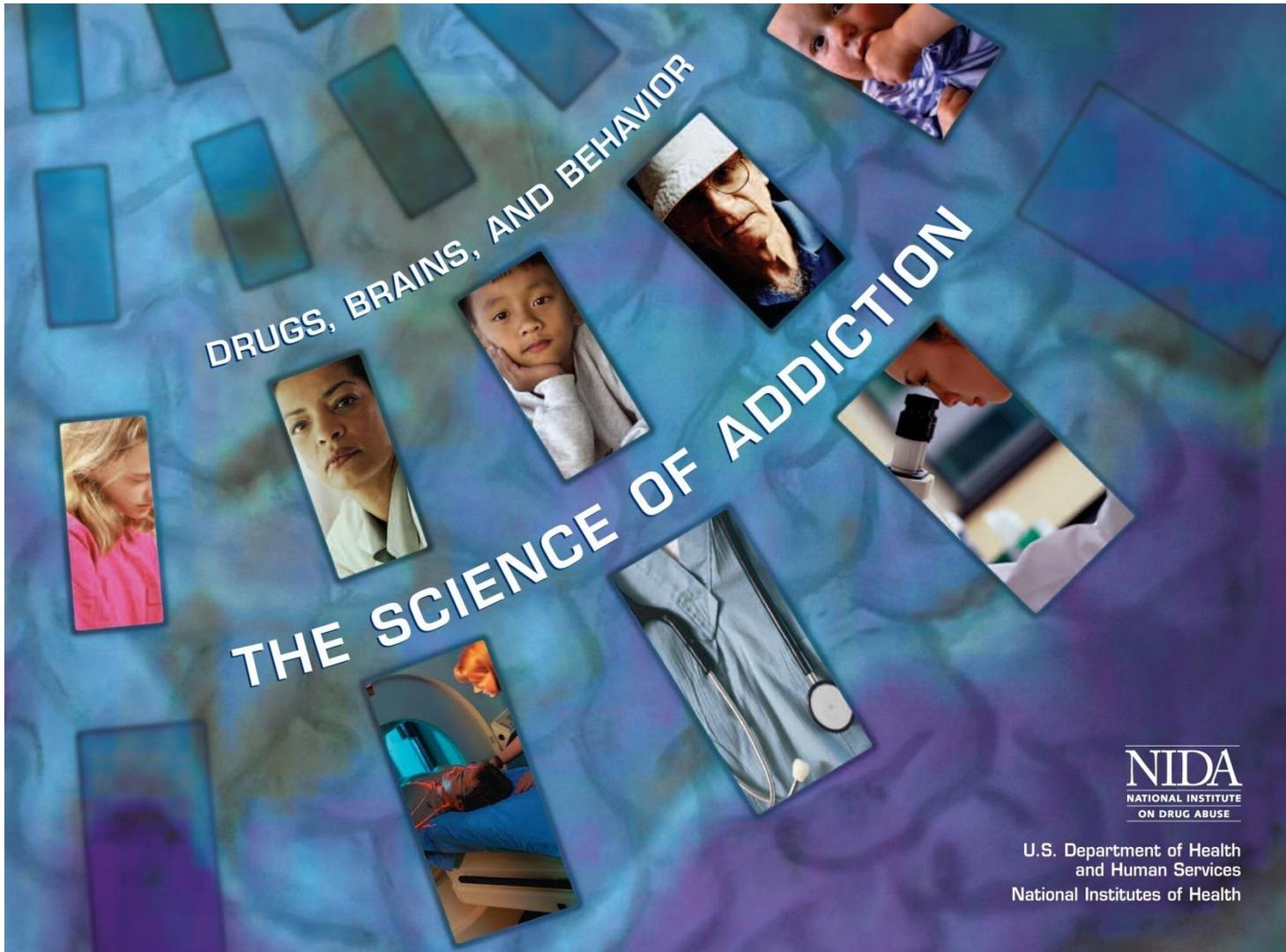
***ALSO IN THIS ISSUE:***

Crime's Decline—Why?

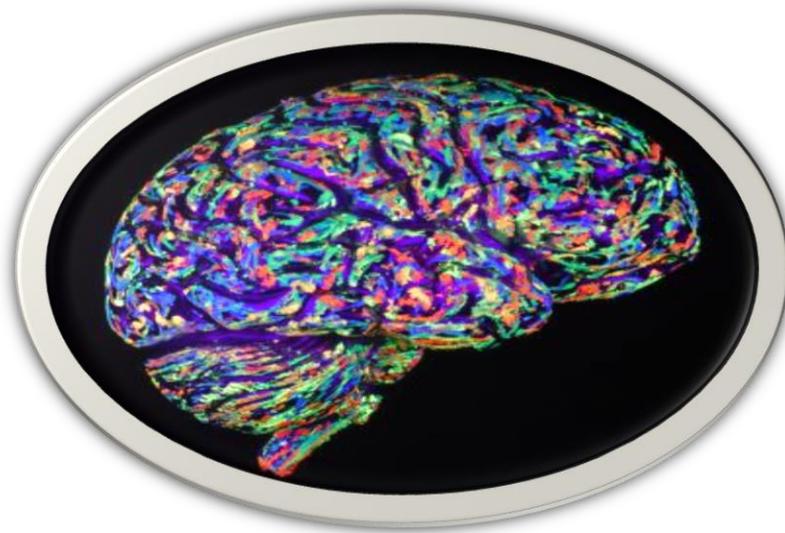
The IDENT System: Putting "Structure to the Chaos of the Border"

Reducing Crime by Harnessing International Best Practice

Using City-Level Surveys to Better Understand Community Policing



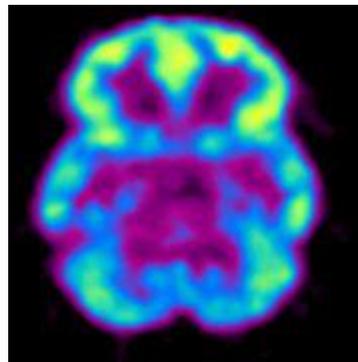
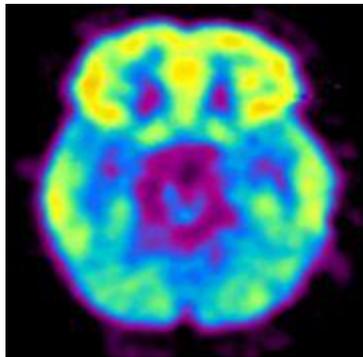
# What can neuroscience teach us about addiction and recovery?



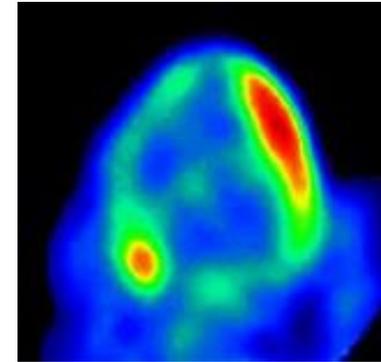
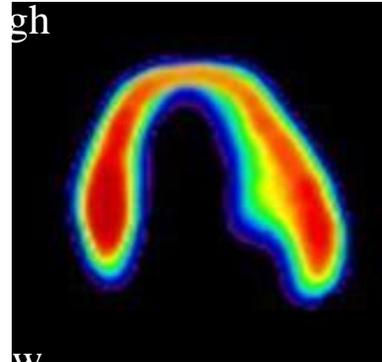
# ***Addiction is Like Other Diseases...***

- **It is preventable.**
- **It is treatable.**
- **It changes biology.**
- **If untreated, it can last a lifetime.**

## **Decreased Brain Metabolism in *Drug Abuser***

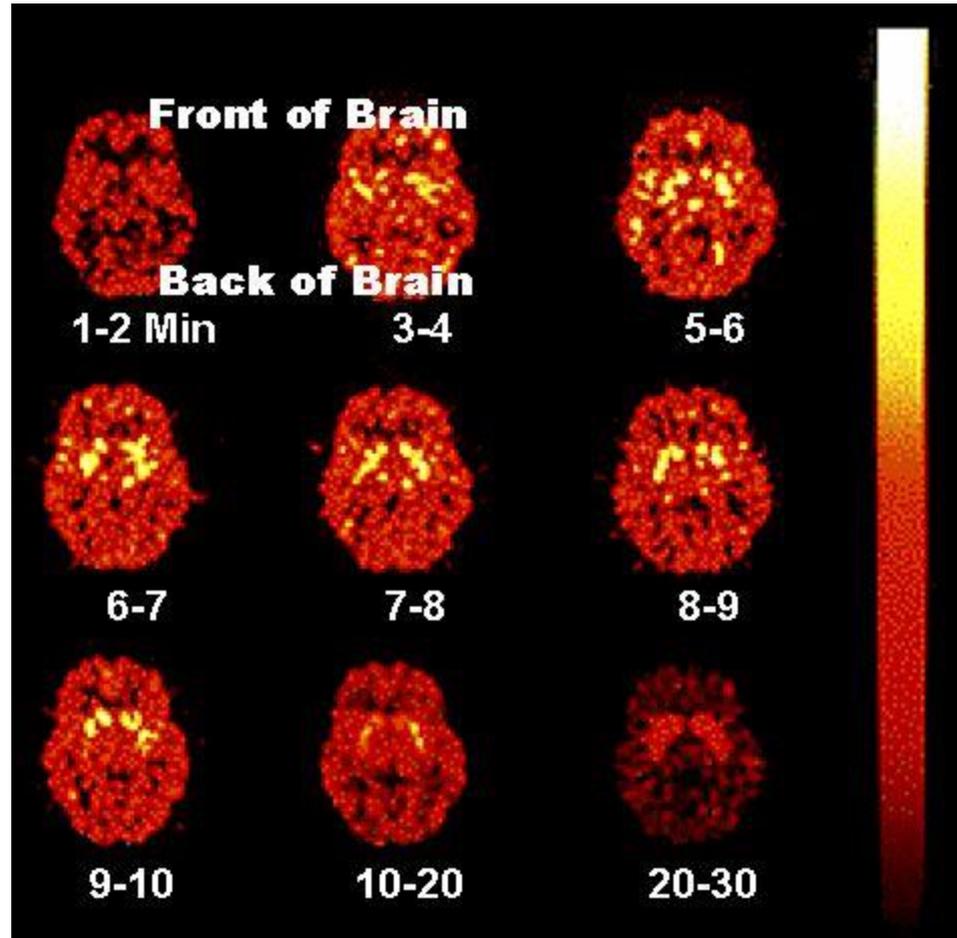


## **Decreased Heart Metabolism in *Heart Disease Patient***



*Research supported by NIDA addresses all of these  
components of addiction.*

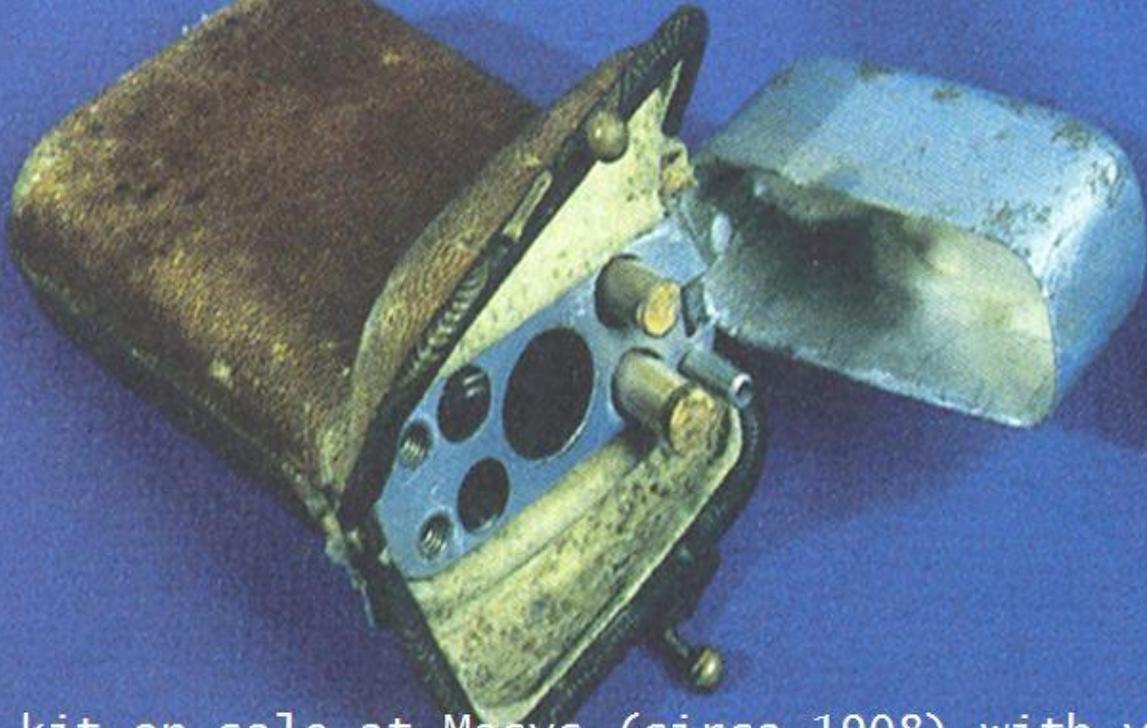
# *Your Brain on Drugs Today*



**YELLOW**  
shows places in  
brain where  
cocaine binds  
(e.g., striatum)

# Science is showing us:

- **Abuse** of alcohol and other drugs are *preventable behaviors*
- Alcohol and drug **addiction** is a disease that people can recover from
- **Recovery** from addiction is a reality and happens *every day*



Drug kit on sale at Macys (circa 1908) with vials of cocaine and heroin. Sears Roebuck also sold a drug kit. Courtesy of Fritz Hugh Ludlow Memorial Library.



# Attitudes about addiction and recovery throughout history

- Disease?
- Behavioral problem?
- Self-inflicted vice?
- Moral/emotional weakness?

# Why the science of addiction and recovery is important

For the Family and General Public:

- helps explain the unexplainable.
- reduces stigma, blame and anger (for family and person with addiction).

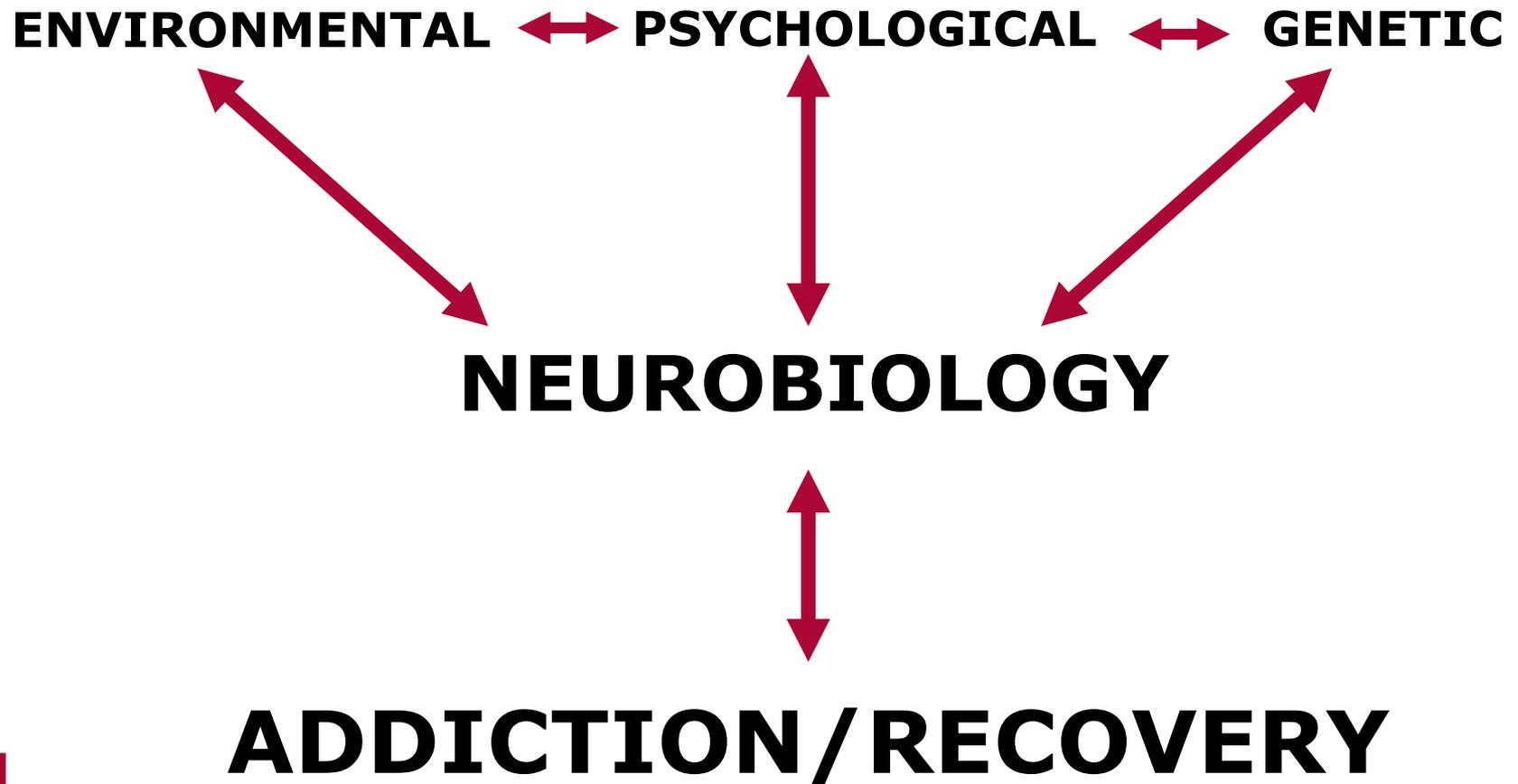
# Why the science of addiction and recovery is important

- For the Recovering Person
  - helps people on their recovery journeys
  - helps people understand their cravings
- Facilitates the recovery process for person and family members

# Why the science of addiction and recovery is important

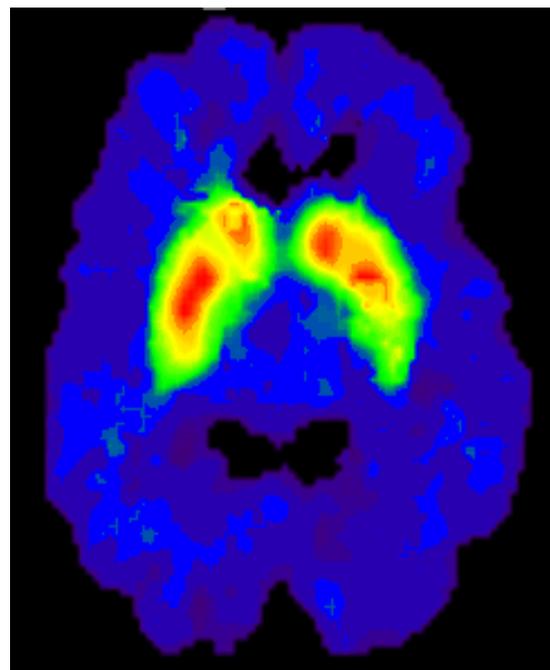
- What are markers that addiction is a disease?
  - can be reliably produced and easily recognized in animals.
  - patterns of intake resemble humans' - drug for drug.
- Also follows behavioral symptoms of other chronic diseases
  - resistance, denial, anger, relapse, etc.

# Thinking about addiction and long term recovery.

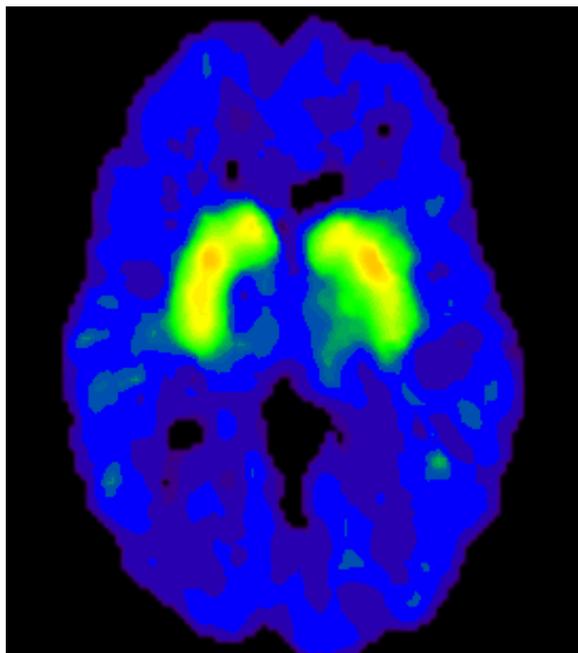


# Recovery is real!

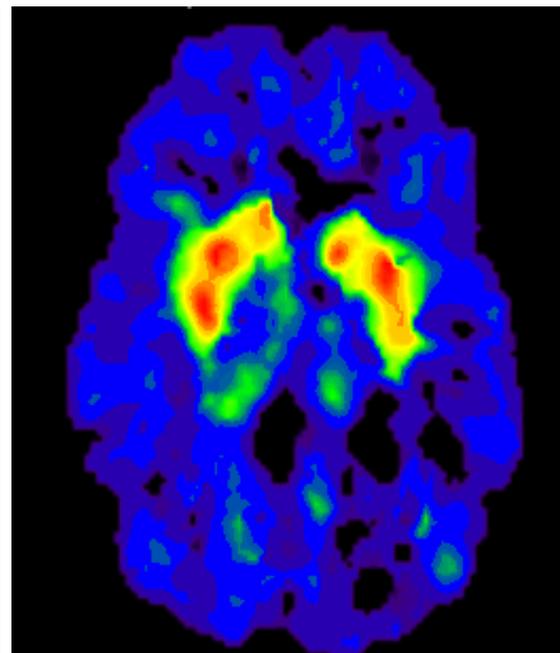
## Partial Recovery of Brain Dopamine Transporters in Methamphetamine (METH) User After Protracted Abstinence



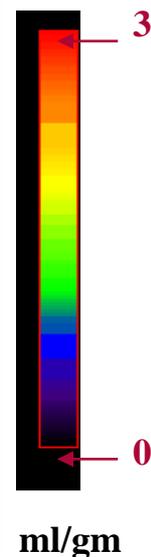
Normal Control



METH User  
(1 month detox)



METH User  
(14 months detox)



Source: Volkow, ND et al., *Journal of Neuroscience* 21, 9414-9418, 2001.

# Why do people use alcohol and other drugs?

*Drawings courtesy of Vivian Felsen*

***To feel good***

***To have  
novel:  
Feelings  
Sensations  
Experiences  
AND***

***To share  
them***



***To feel better***

***To lessen:***

***Anxiety***

***Worries***

***Fears***

***Depression***

***Hopelessness***

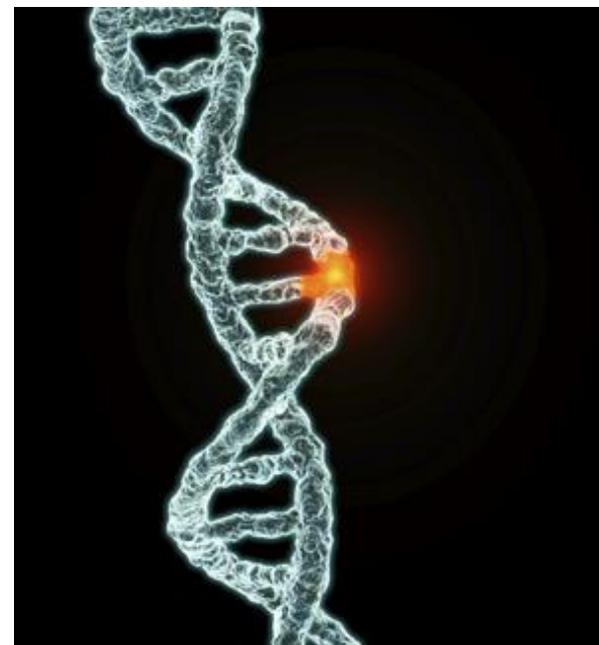
A major reason people take a drug is they like what it does to their brains.

# Vulnerability

Why do some people  
become addicted while  
others do not?



- We know there's a big genetic contribution to addiction ...
- But the nature of this contribution is extremely complex



# The brain's complexity

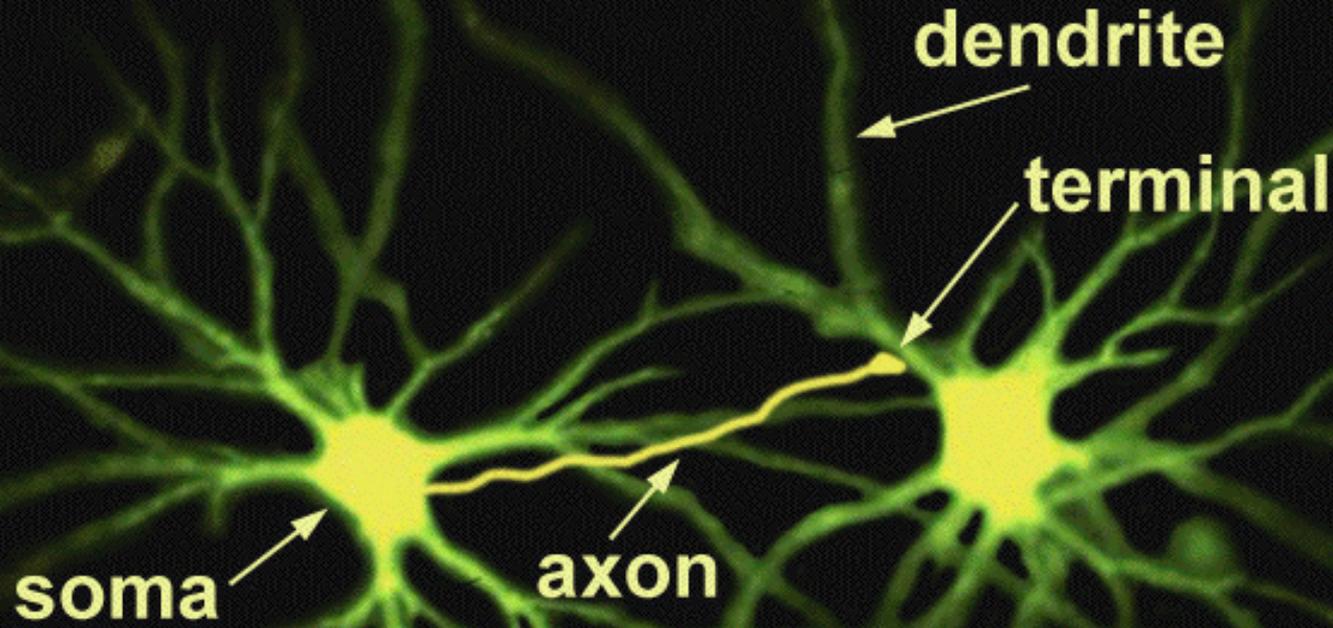
- Approximately 3 pounds on average
- Several thousand miles of interconnected nerve cells (86 billion)
- 10,000 varieties of neurons
- Trillions of supportive cells
- Trillions more synaptic connections
- Miles of blood vessels

# The brain's complexity

- Responsible for initiating and controlling:
  - every movement
  - thought
  - sensation
  - emotion
- That make up the human experience!

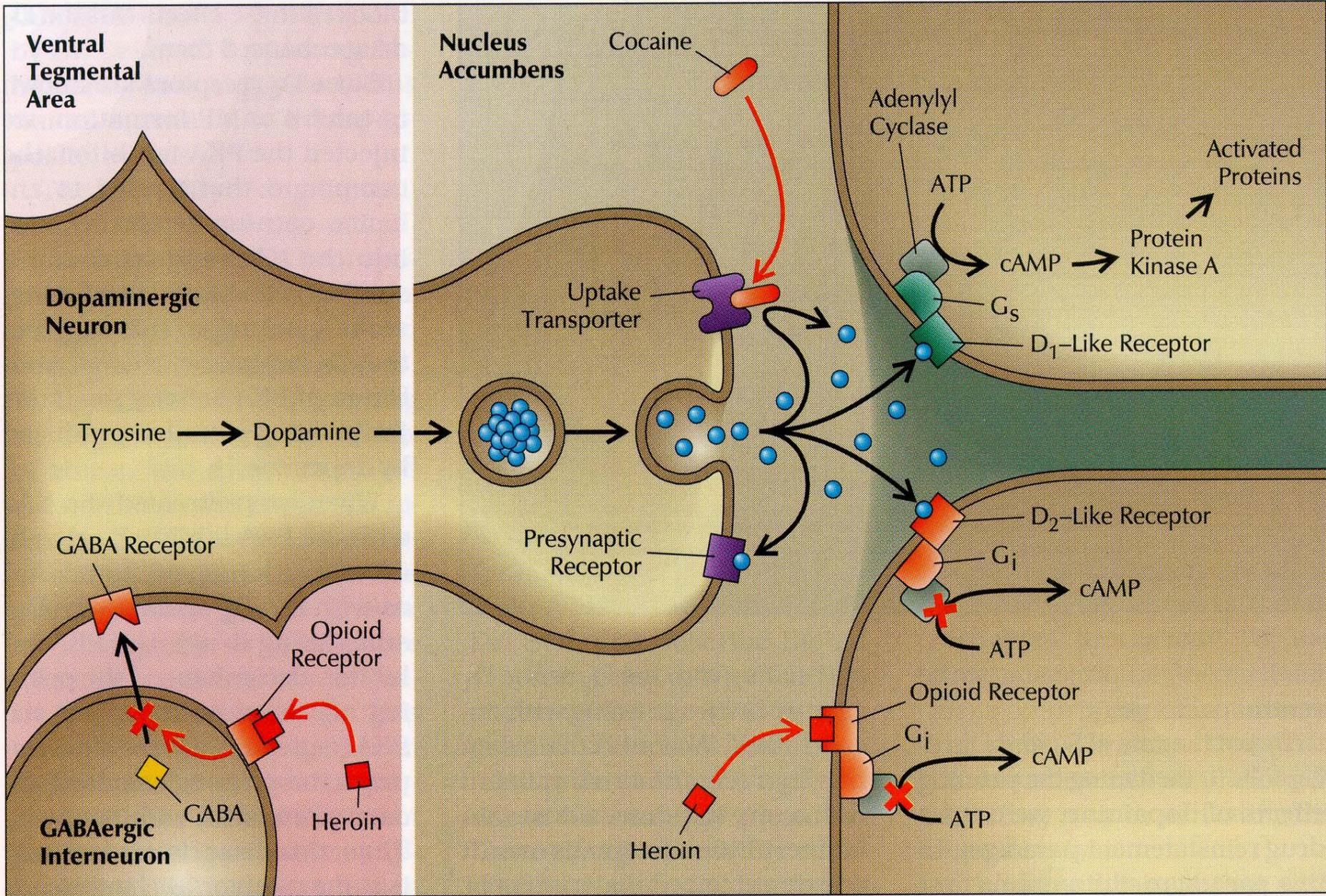
# Communication of the brain

- Neuron = nerve cell
- Nerve cells have many different shapes, depending on the cluster of specialization in the brain.



Source: National Institute on Drug Abuse Teaching Packet





<http://learn.genetics.utah.edu/content/addiction/mouse/>

 Learn.Genetics  
GENETIC SCIENCE LEARNING CENTER

Home / The Science of Addiction: Genetics and the Brain / Mouse Party

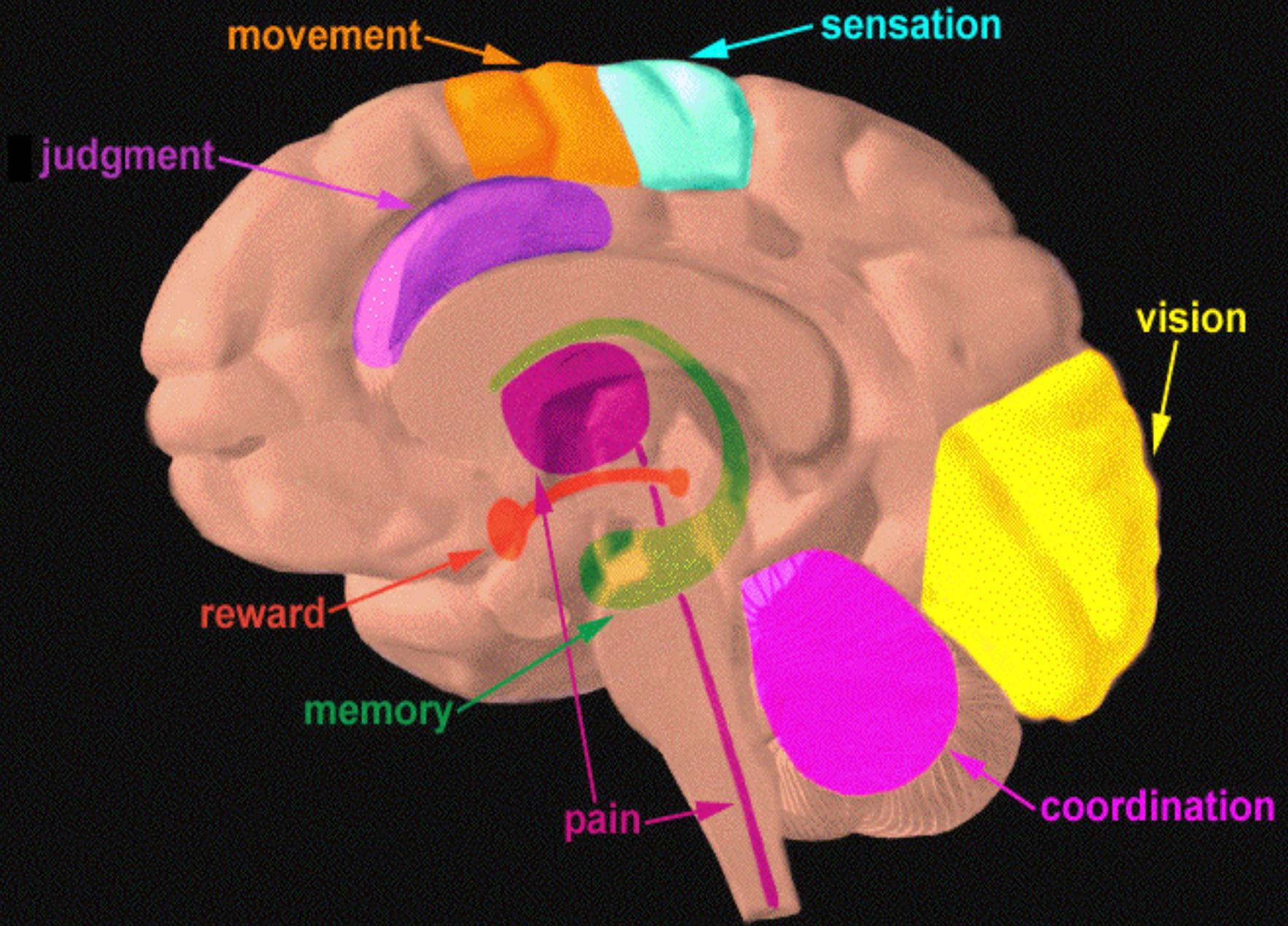
## Mouse Party



Note:

The simplified mechanisms of drug action presented here are just a small part of the story. When drugs enter the body they elicit very complex effects in many different regions of the brain. Often they interact with many different types of neurotransmitters and may bind with a variety of receptor types in a variety of different locations. For example, THC in marijuana can bind with cannabinoid receptors located on the presynaptic and/or postsynaptic cell in a synapse.

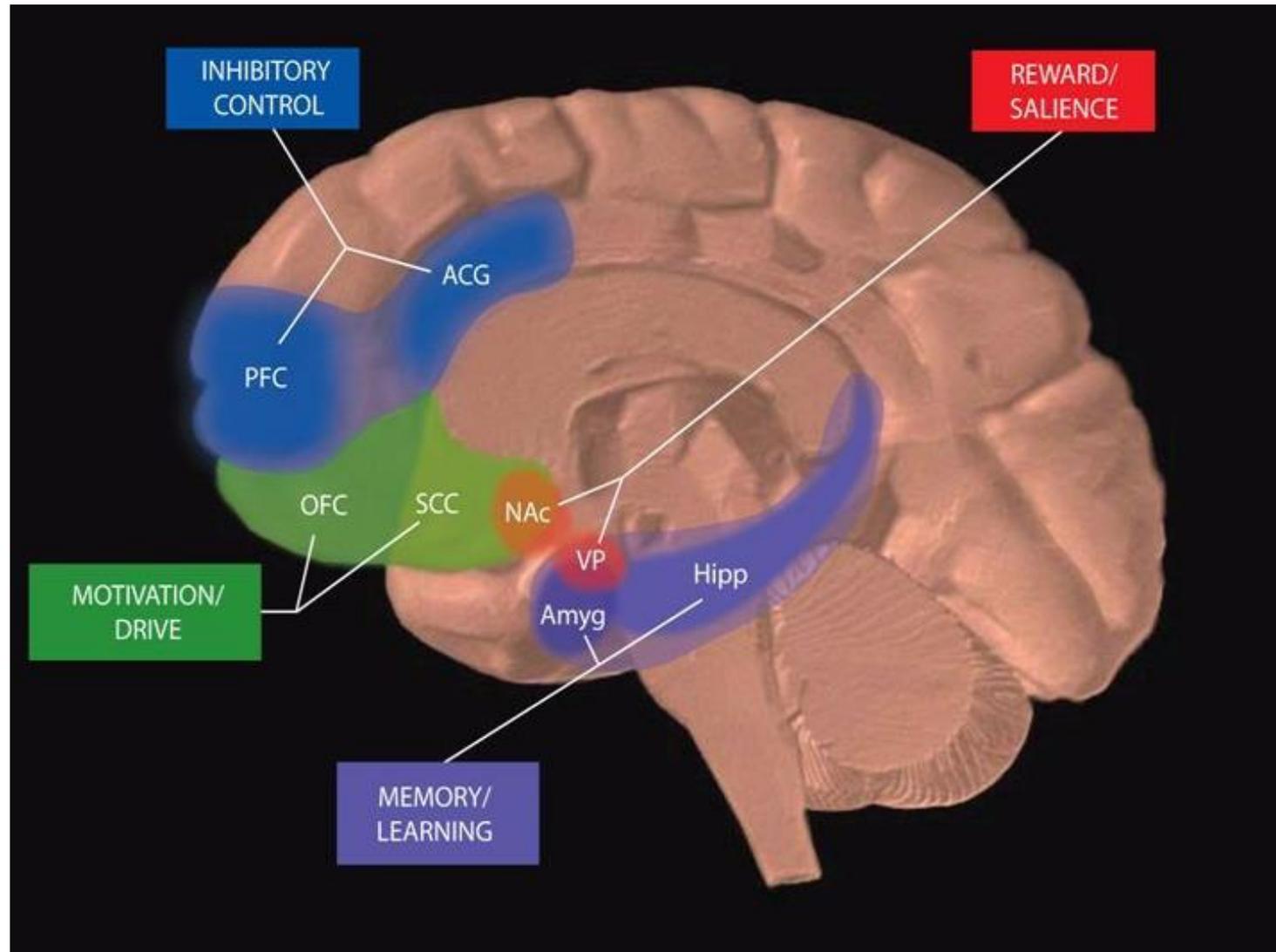
Where applicable, this presentation primarily depicts how drugs interact with dopamine neurotransmitters because this website focuses on the brain's reward pathway. Mouse Party is designed to provide a small glimpse into the chemical interactions at the synaptic level that cause the drug user to feel "high".



Source: National Institute on Drug Abuse Teaching Packet



# Circuits Involved in Drug Abuse and Addiction

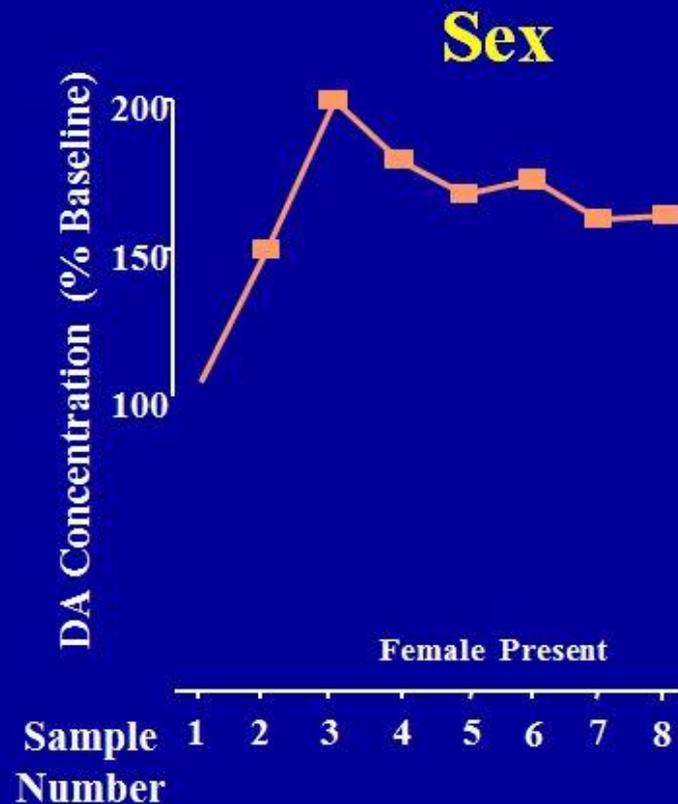
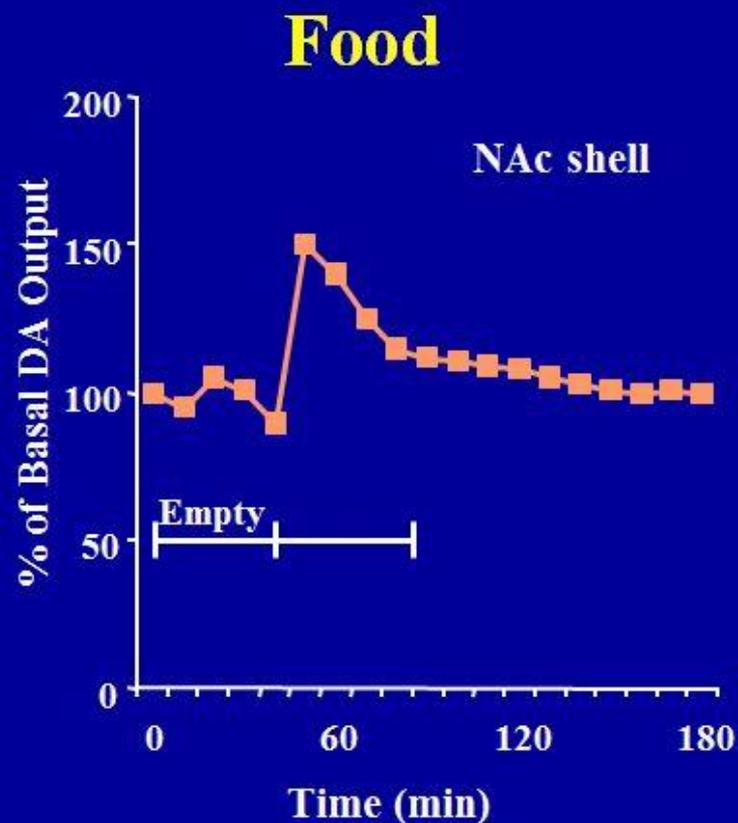


**All of these brain regions must be considered in developing strategies to effectively treat addiction**

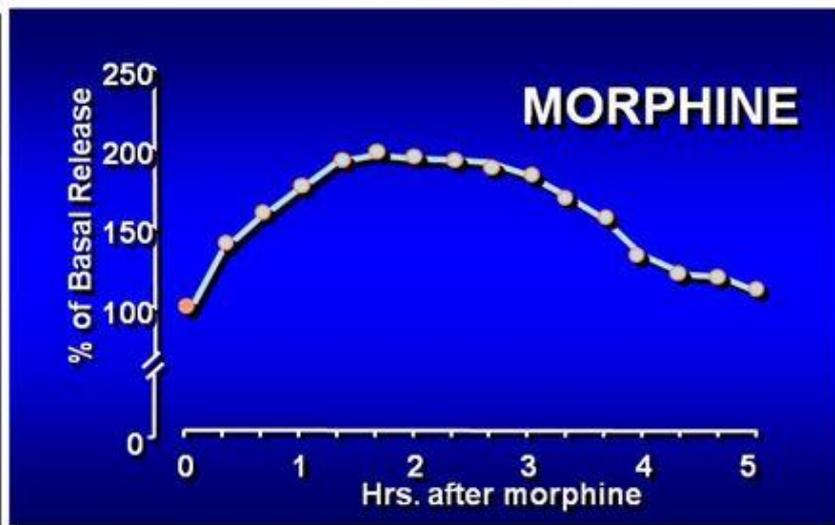
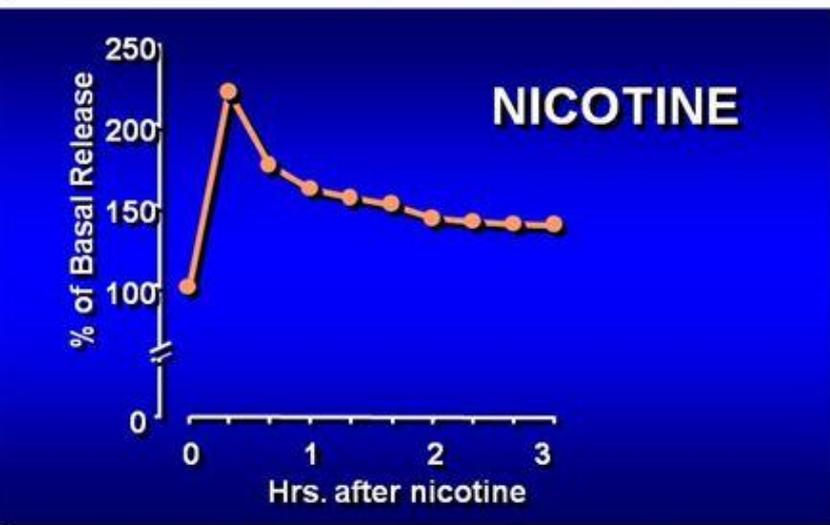
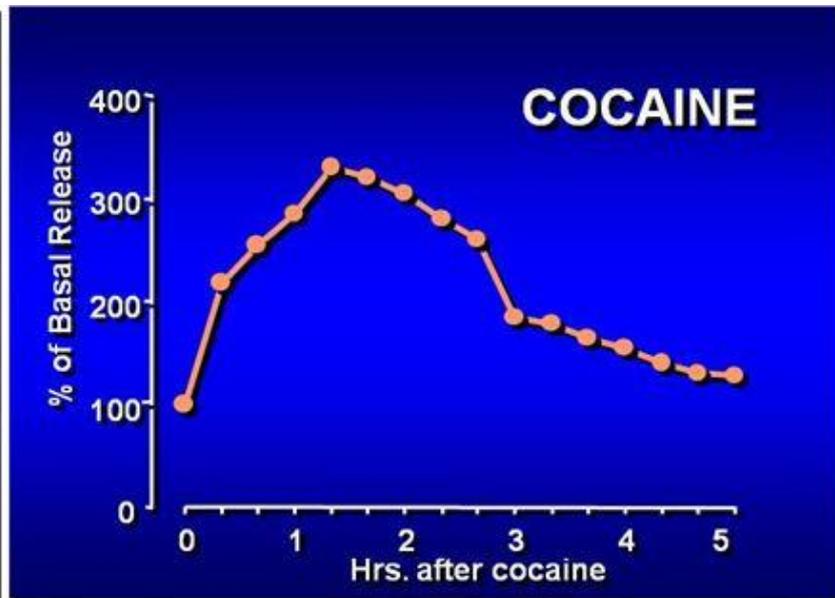
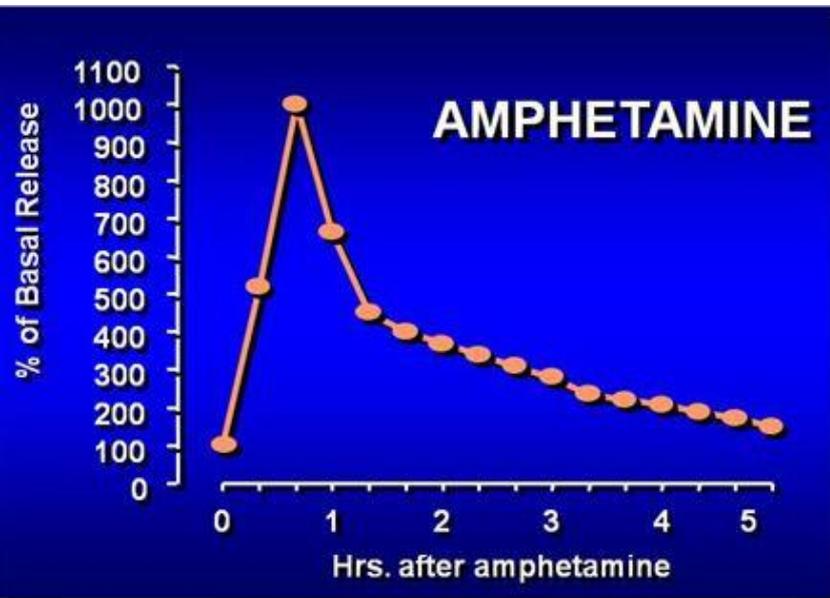
# How do alcohol and other drugs work in the brain?

Despite many differences, virtually all substances with the potential for addiction affect dopamine levels in the pleasure/reward pathway of the brain.

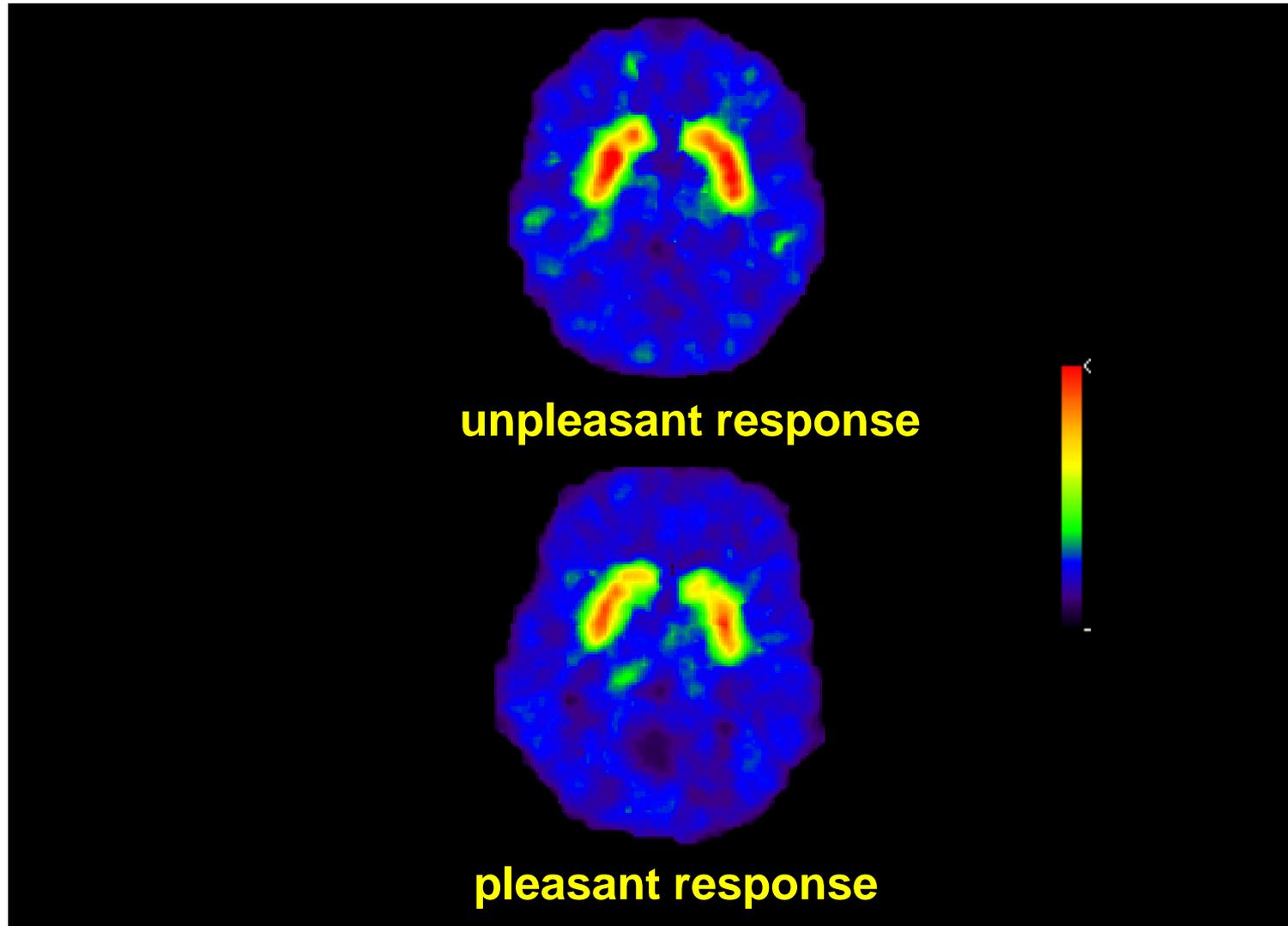
# Natural Rewards Elevate Dopamine Levels



# Effects of Drugs on Dopamine Release



# DA Receptor Levels and Response to MP



**Subjects with low receptor levels found MP pleasant while those with high levels found MP unpleasant**

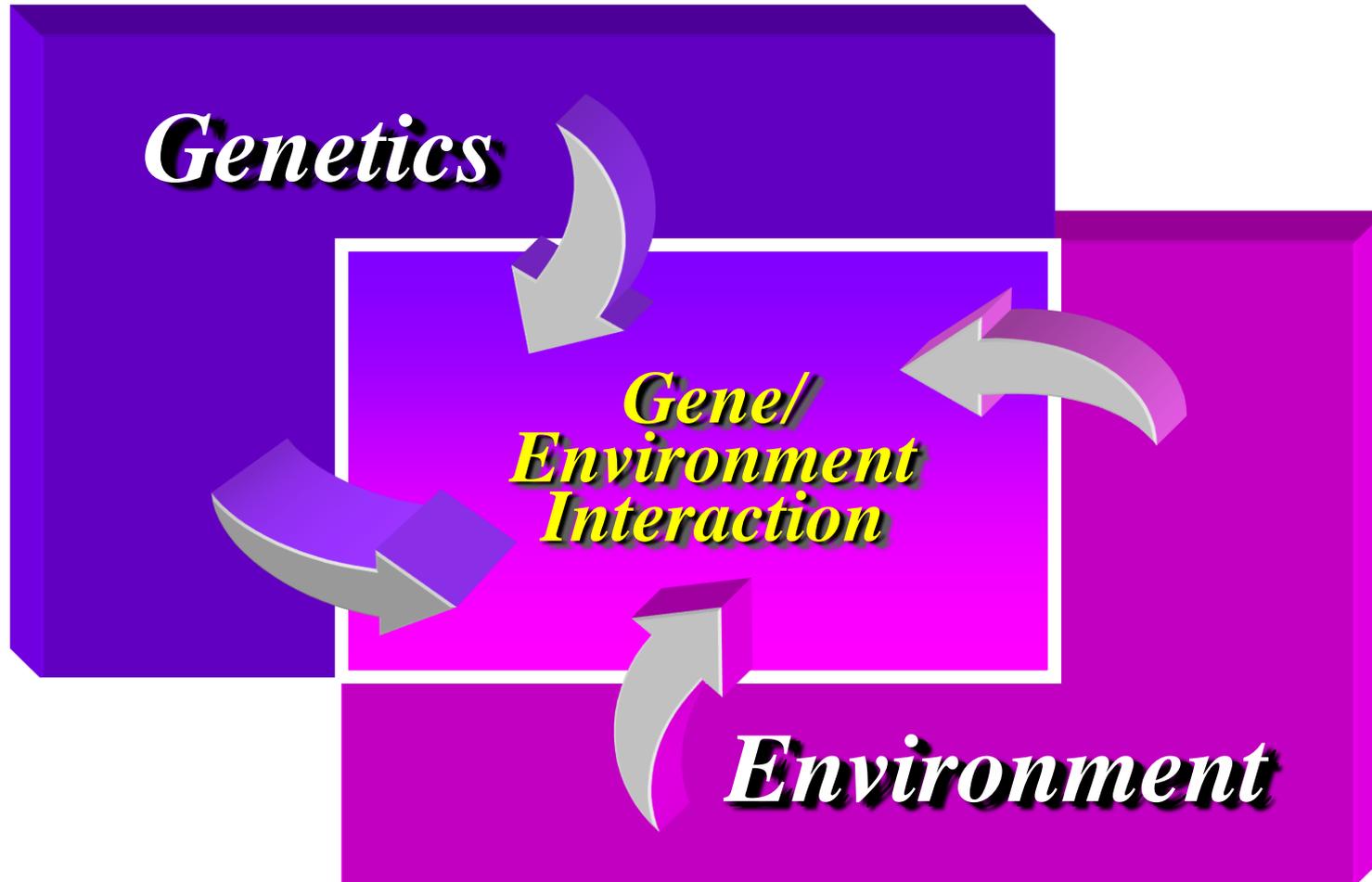
Initially, a person takes a drug hoping to change their mood, perception, or emotional state

## **TRANSLATION . . .**

Hoping to change their brain.

The system that becomes captured by the addicting drug is a complex system that sets behavioral priorities.

# A complex behavioral and neurobiological disorder



Source: National Institute on Drug Abuse Presentation

# Dr. Nora Volkow



<https://www.youtube.com/watch?v=Mnd2-al4LCU>

[https://www.youtube.com/watch?v=JH7zq0\\_VA9U](https://www.youtube.com/watch?v=JH7zq0_VA9U) 2.37

minutes



# Where addiction starts

- Called by many names (mesolimbic system, old brain, primitive brain, etc.)
- As it reacts to “environment”:
  - creates powerful emotional memories (both fear and pleasure) that drive behavior in all of us for survival.

# Neuroscience of addiction

## What is Addiction?

### **Not Just Tolerance**

Reduced drug effect with repeated administration of the same dose of a drug, or need for an increased dose to maintain the same level of effect.

### **Not Just Physical Dependence**

When drug cessation produces pathologic symptoms and signs.

# Addiction is:

A Brain Disorder which manifests as:

1. Compulsive non-medical use of a substance.
2. Loss of control over its use.
3. Continued use despite negative consequences.

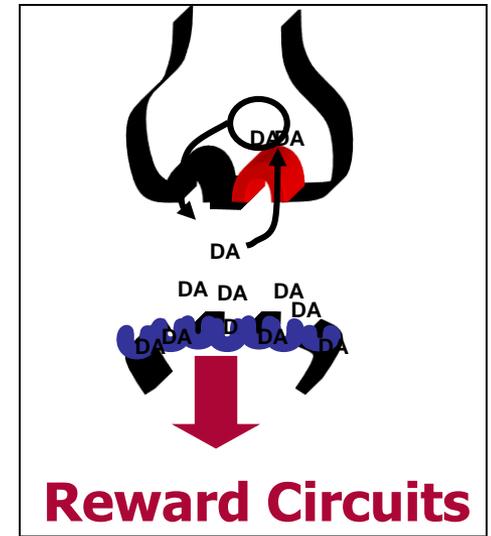
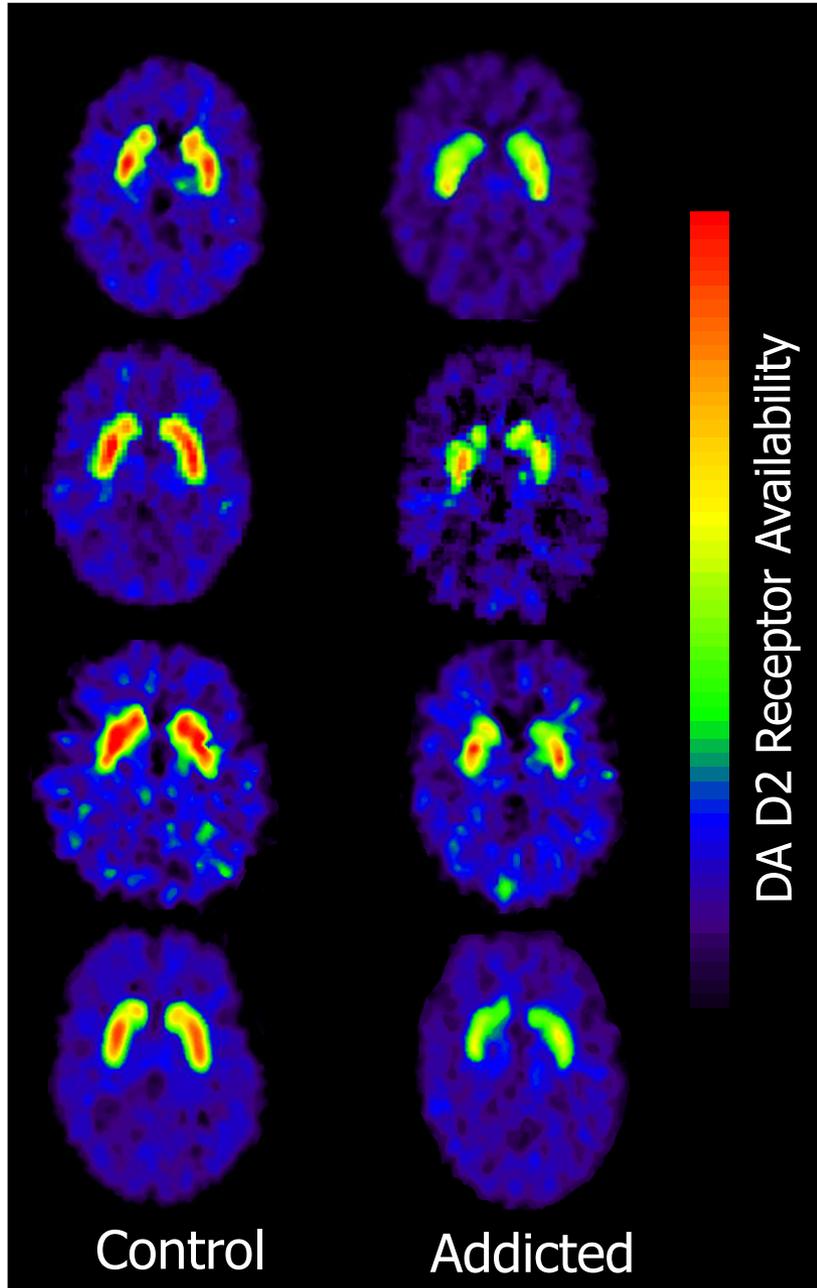
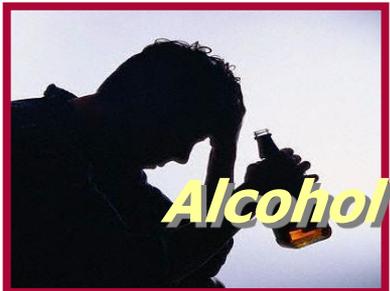
So.....

Prolonged use of addicting drugs changes the brain in fundamental and long-lasting ways.

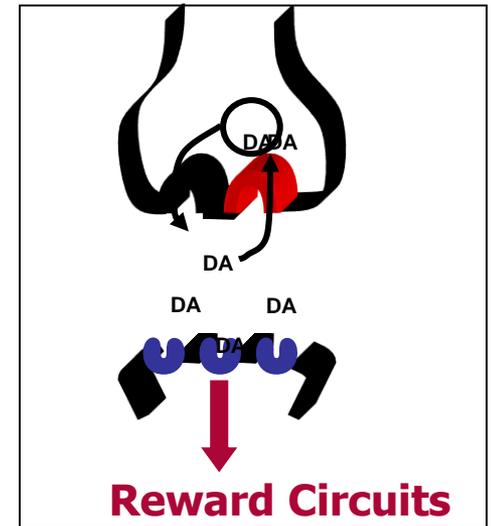
and....

We have evidence that these changes can be both structural and functional.

# Dopamine D2 Receptors are Lower in Addiction



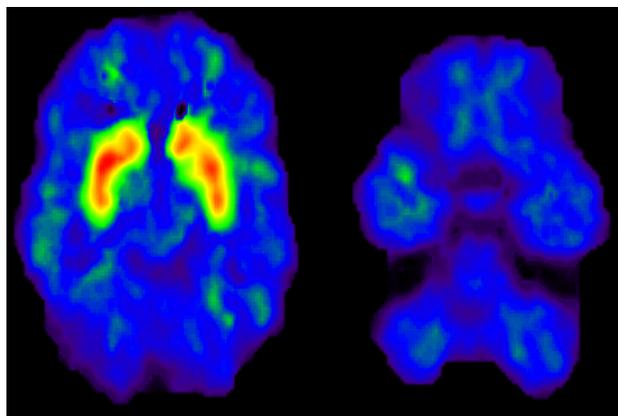
Non-Addicted



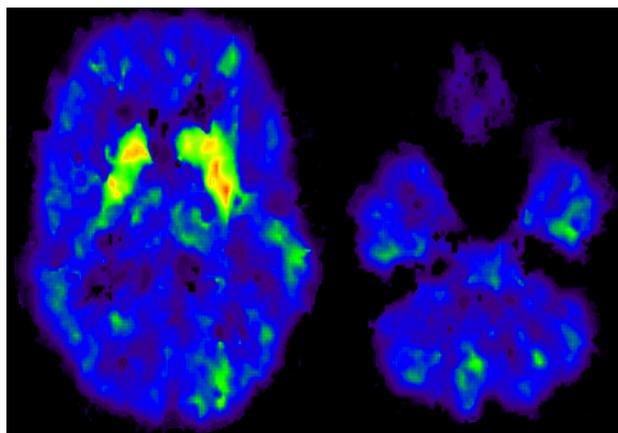
Addicted

Adapted from Volkow et al., *Neurobiology of Learning and Memory* 78: 610-624, 2002.

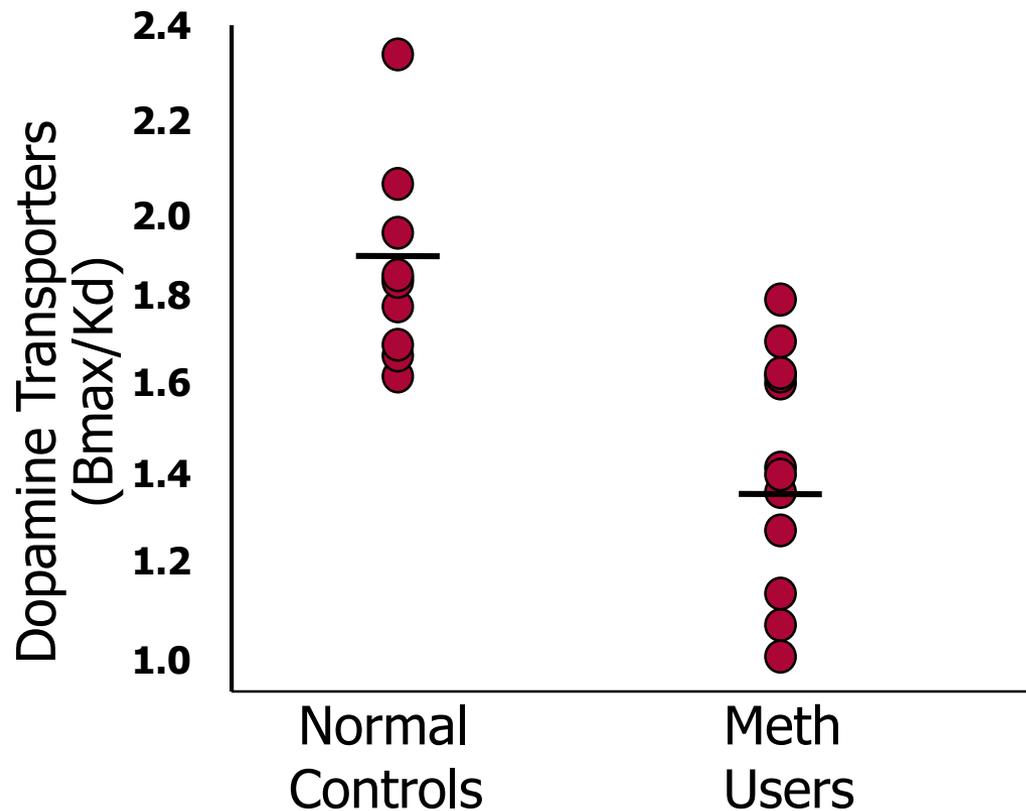
# Dopamine Transporters in Methamphetamine Users



Normal Control



Methamphetamine User

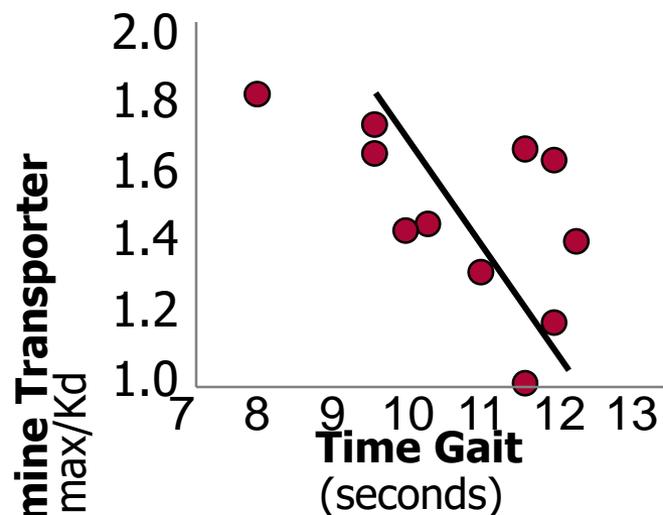


$p < 0.0002$

Adapted from Volkow et al., *Am J Psychiatry* 158:3, 377-382, 2001.

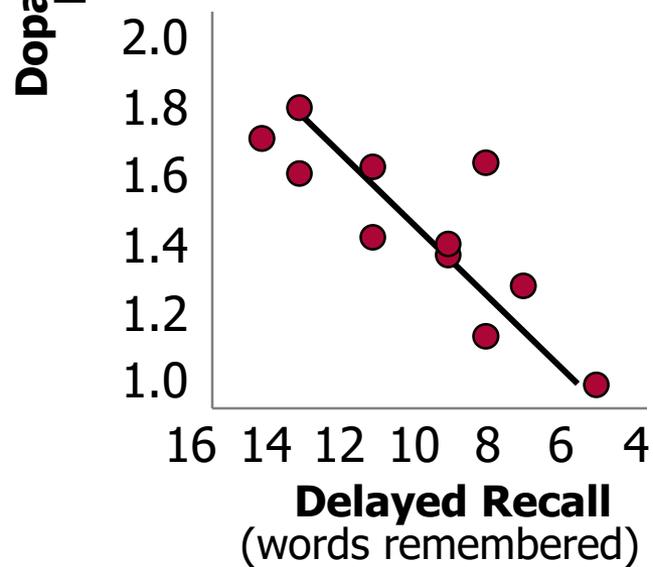
*Methamphetamine users have significant reductions in dopamine transporters.*

# Dopamine Transporters in People Addicted to Methamphetamine



## Motor Task

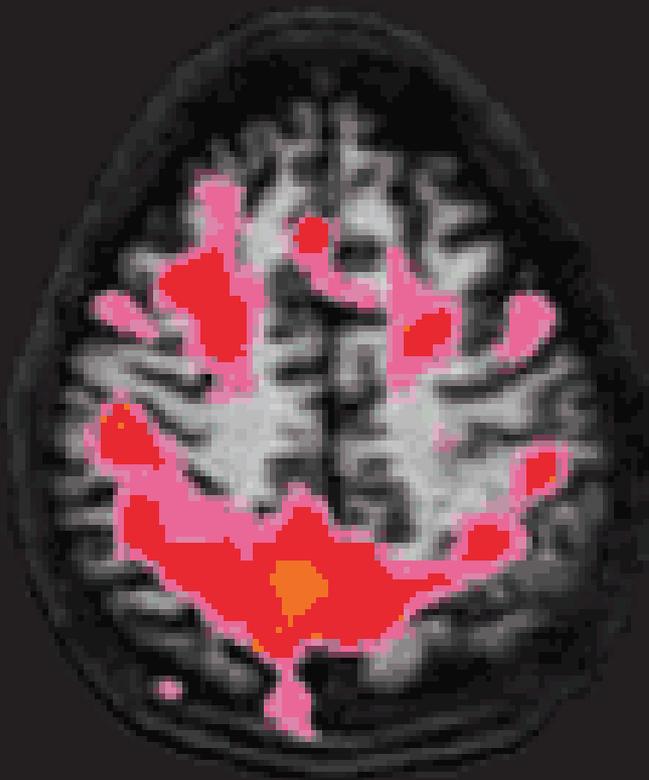
Loss of dopamine transporters in the meth abusers may result in slowing of motor reactions.



## Memory Task

Loss of dopamine transporters in the meth abusers may result in memory impairment.

**15-year-old male  
non-drinker**



**15-year-old male  
heavy drinker**



Source: Dr. Susan Tapert; University of California- San Diego

# Understanding people's behavior while addicted

## Key Concept:

- The parts of the brain that have become changed from addiction override the factual memory storage (hippocampus) and logical reasoning (prefrontal cortex).
- Thus behavior (e.g., repeated relapses) that “flies” in the face of logic now makes sense.

# Vulnerabilities for addiction and recovery

- Choice of Drug
- Route of Administration
- Dose
- Frequency
- Length of Use
- Motivations for Use

# Vulnerabilities for addiction and recovery

- Genetic
- Developmental / Emotional
- Psychiatric Co-morbidity
- Chronic Pain
- Stress
- Goals (experimentation, escape, self-medication)

These vulnerabilities can change over time.

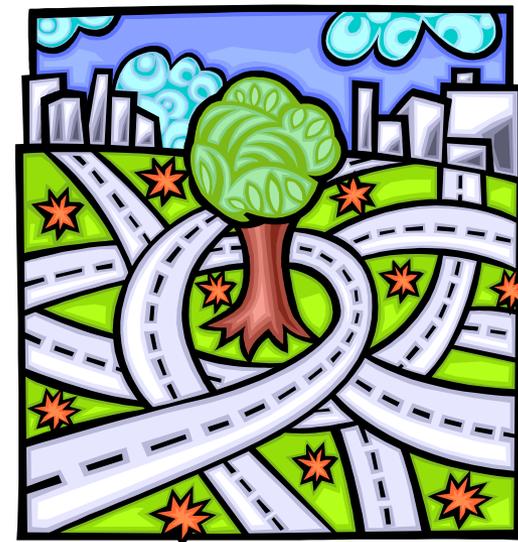
# Environmental factors contributing to addiction and recovery

- Availability
- Acceptability ----- Pressure
- Alternatives to drug use
- Settings (religious, parties, alone)
- Presence of conditioned cues

# Paths to Recovery

## There are many pathways:

- Mutual support groups
- Professional treatment
- Faith
- Medication-assisted
- “Natural” or on your own
- And many more



# What about relapse? Why Can't They Stay Quit?

Form of Classical Conditioning

Sets off physiological chain reaction  
in the body – coming from the brain



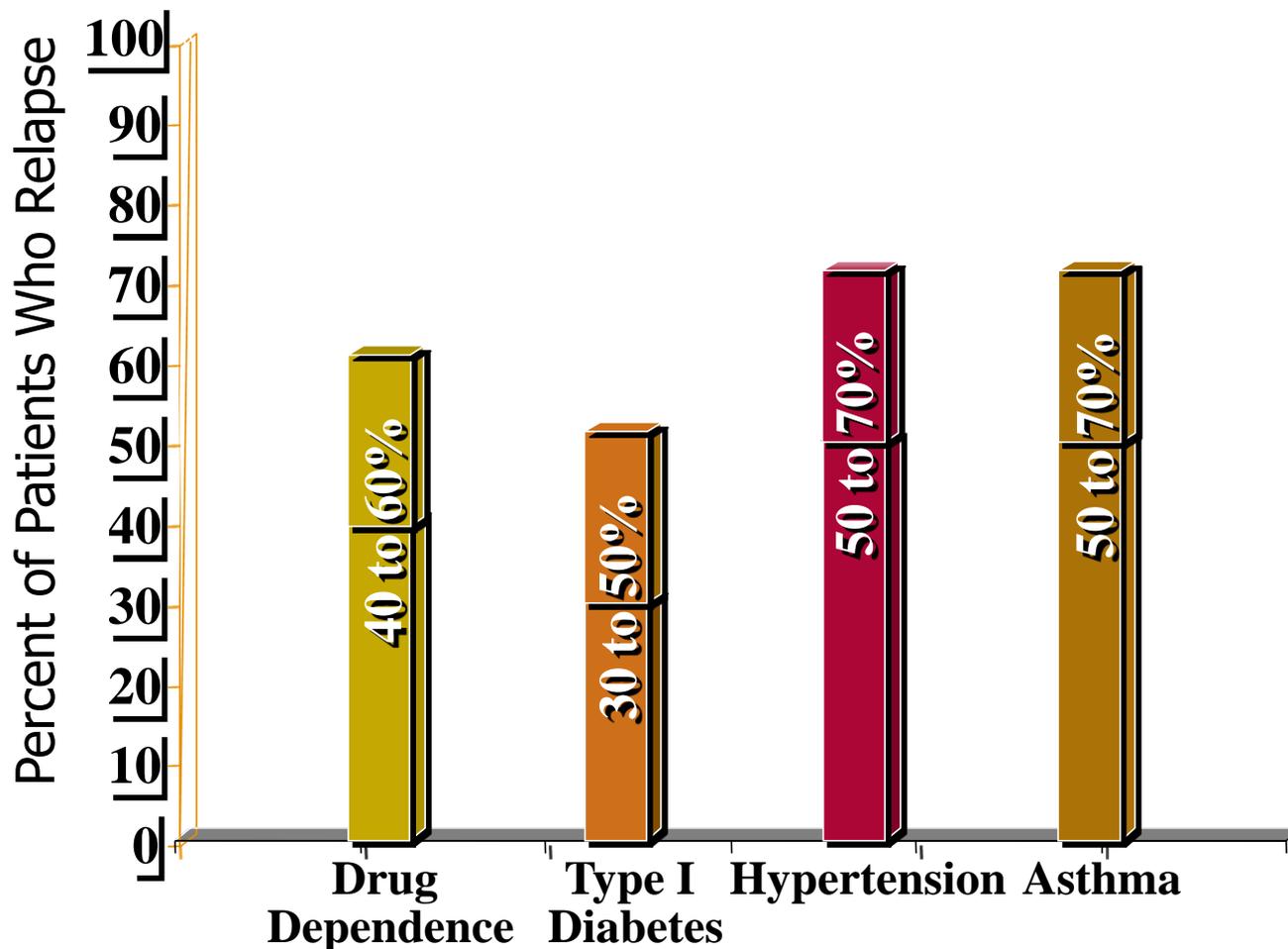
# What about relapse?

- Examples of external triggers:
  - Cash
  - Fridays
  - Using “buddies”

# What about relapse?

- Examples of internal triggers:
  - loneliness
  - celebration
  - emotional pain

# Relapse Rates Are Similar for Addiction and Other Chronic Illnesses



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

Science is revealing much about addiction and recovery **and** what works in treatment and other pathways to recovery.

# Recovery can and does happen!

Research has shown that:

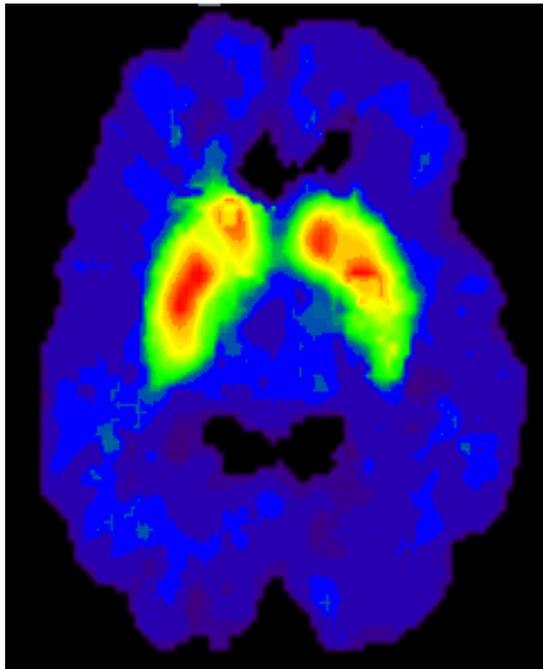
- The brain has a remarkable ability to adapt, heal and change.
- The key is the length of time and experiences after drug leaves system.

# The recovery process takes time

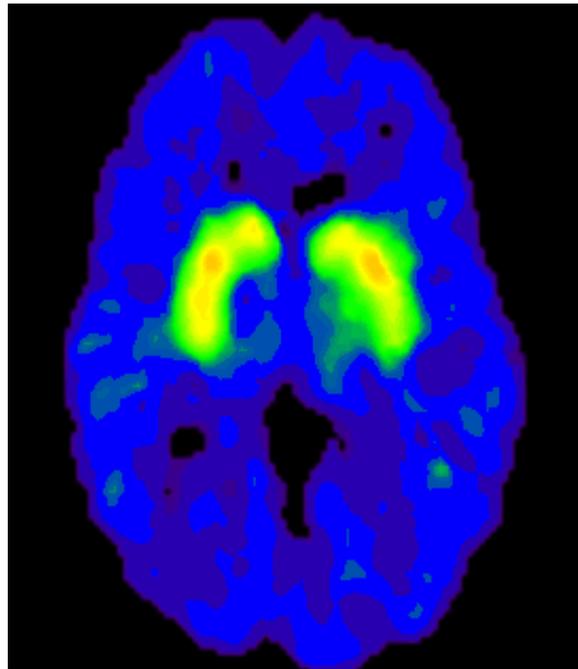
- For the brain to heal
- To reduce the effects of relapse cues
- To learn new ways of reacting to the environment

# Recovery is real!

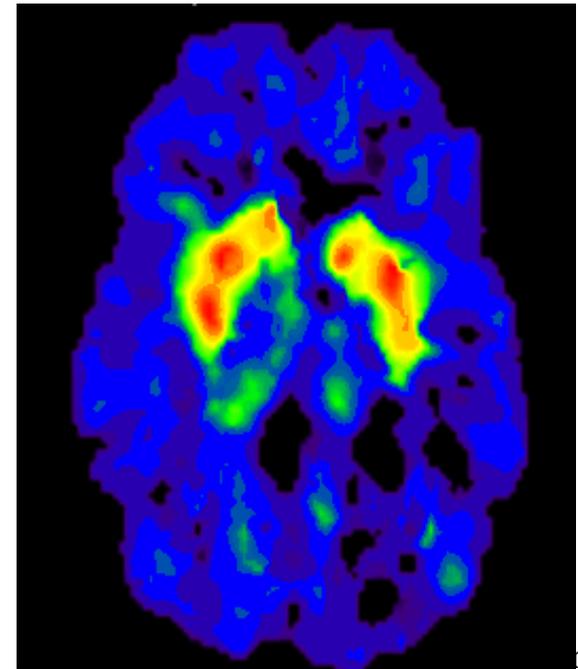
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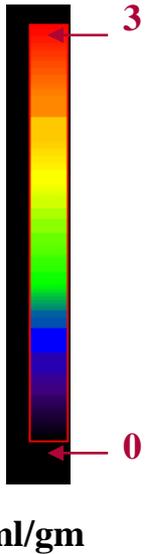
**Normal Control**



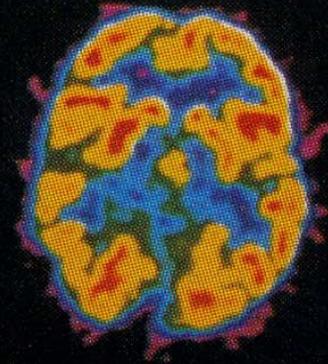
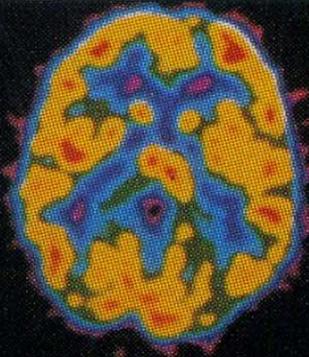
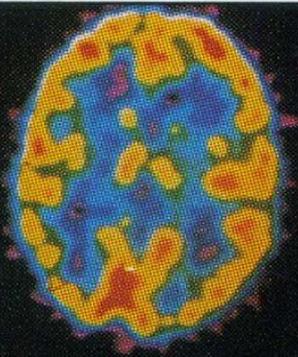
**METH Abuser  
(1 month detox)**



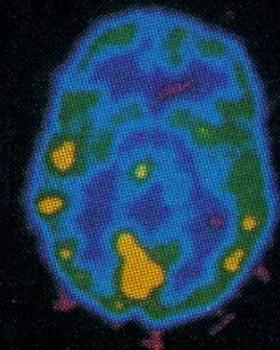
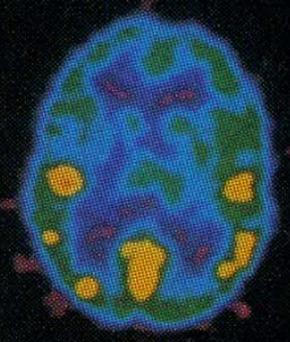
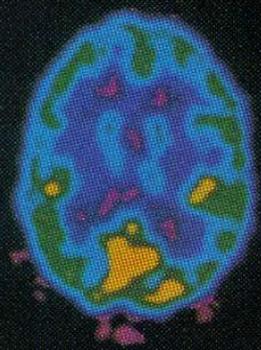
**METH Abuser  
(14 months detox)**



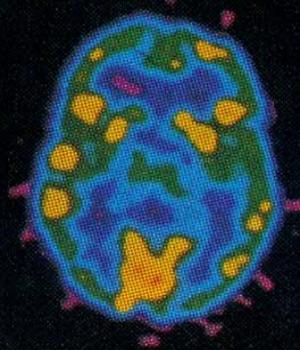
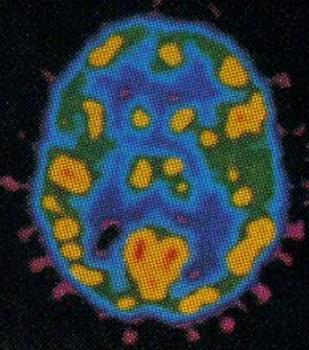
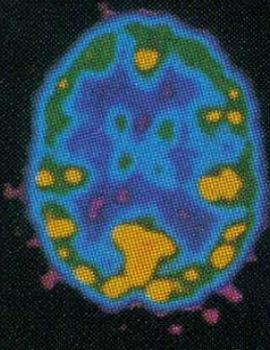
*Source: Volkow, ND et al., Journal of Neuroscience 21, 9414-9418, 2001.*



**NORMAL**



**COCAINE ABUSER (10 days)**



**COCAINE ABUSER (100 days)**



Sources: Volkow, et al., *Synapse*, 11:184-190, 1992  
& Volkow, et al., *Synapse*, 14:169-177, 1993

# Helping the Brain Heal

Managing and sustaining recovery may mean:

- Medically
- Behaviorally
- Contextually

# Now you know!

## Like other chronic diseases

- The pathways to recovery are many
- People attain and stay in recovery every day
- If relapse occurs, like other chronic conditions, the recovery journey can continue.

- There are millions of Americans in long-term recovery.
- Recovery is a Reality



# FOR-NY Staff and Consultant Support

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# The Science of Addiction and Recovery – for Everyone!

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