

# A Neuroscientist Uncovers A Dark Secret

by BARBARA BRADLEY HAGERTY

*First in a three-part series. You can hear this piece on Tuesday's Morning Edition.*



[Enlarge](#)

Courtesy of Jim Fallon

Fallon with his wife, daughters and son. When he compared the brain scans of his family -- including his wife, siblings, children and mother -- his was the only one that resembled the brain of a psychopath.

June 28, 2010

text size **A A A**

The criminal brain has always held a fascination for James Fallon. For nearly 20 years, the neuroscientist at the University of California-Irvine has studied the brains of psychopaths. He studies the biological basis for behavior, and one of his specialties is to try to figure out how a killer's brain differs from yours and mine.

About four years ago, Fallon made a startling discovery. It happened during a conversation with his then 88-year-old mother, Jenny, at a family barbecue.

"I said, 'Jim, why don't you find out about your father's relatives?' " Jenny Fallon recalls. "I think there were some cuckoos back there."

Fallon investigated.

"There's a whole lineage of very violent people — killers," he says.

One of his direct great-grandfathers, Thomas Cornell, was hanged in 1667 for murdering his mother. That line of Cornells produced seven other alleged murderers, including Lizzy Borden. "Cousin Lizzy," as Fallon wryly calls her, was accused (and controversially acquitted) of killing her father and stepmother with an ax in Fall River, Mass., in 1882.

A little spooked by his ancestry, Fallon set out to see whether anyone in his family possesses the brain of a serial killer. Because he has studied the brains of dozens of psychopaths, he knew precisely what to look for. To demonstrate, he opened his laptop and called up an image of a brain on his computer screen.

"Here is a brain that's not normal," he says. There are patches of yellow and red. Then he points to another section of the brain, in the front part of the brain, just behind the eyes.

"Look at that — there's almost nothing here," Fallon says.

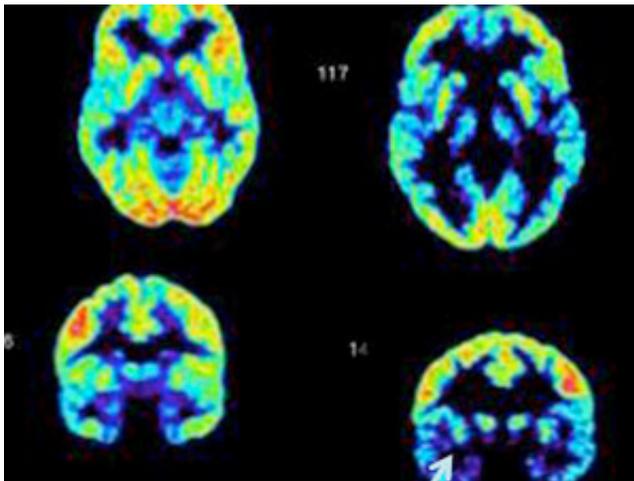
This is the orbital cortex, the area that Fallon and other scientists believe is involved with ethical behavior, moral decision-making and impulse control.

"People with low activity [in the orbital cortex] are either free-wheeling types or sociopaths," he says.

### Fallon's Scans

He's clearly oversimplifying, but Fallon says the orbital cortex puts a brake on another part of the brain called the amygdala, which is involved with aggression and appetites. But in some people, there's an imbalance — the orbital cortex isn't doing its job — perhaps because the person had a brain injury or was born that way.

"What's left? What takes over?" he asks. "The area of the brain that drives your id-type behaviors, which is rage, violence, eating, sex, drinking."



Courtesy of Jim Fallon

Fallon's brain (on the right) has dark patches in the orbital cortex, the area just behind the eyes. This is the area that Fallon and other scientists say is involved with ethical behavior, moral decision-making and impulse control. The normal scan on the left is his son's.

Fallon says nobody in his family has real problems with those behaviors. But he wanted to be sure. Conveniently, he had everything he needed: Previously, he had persuaded 10 of his close relatives to submit to a PET brain scan and give a blood sample as part of a project to see whether his family had a risk for developing Alzheimer's disease.

After learning his violent family history, he examined the images and compared them with the brains of psychopaths. His wife's scan was normal. His mother: normal. His siblings: normal. His children: normal.

"And I took a look at my own PET scan and saw something disturbing that I did not talk about," he says.

What he didn't want to reveal was that *his* orbital cortex looks inactive.

"If you look at the PET scan, I look just like one of those killers."

Fallon cautions that this is a young field. Scientists are just beginning to study this area of the brain — much less the brains of criminals. Still, he says the evidence is accumulating that some people's brains predispose them toward violence and that psychopathic tendencies may be passed down from one generation to another.

### The Three Ingredients

And that brings us to the next part of Jim Fallon's family experiment. Along with brain scans, Fallon also tested each family member's DNA for genes that are associated with violence. He looked at 12 genes related to aggression and violence and zeroed in on the MAO-A gene (monoamine

oxidase A). This gene, which has been the target of considerable research, is also known as the "warrior gene" because it regulates serotonin in the brain. Serotonin affects your mood — think Prozac — and many scientists believe that if you have a certain version of the warrior gene, your brain won't respond to the calming effects of serotonin.

Fallon calls up another slide on his computer. It has a list of family members' names, and next to them, the results of the genotyping. Everyone in his family has the low-aggression variant of the MAO-A gene, except for one person.

"You see that? I'm 100 percent. I have the pattern, the risky pattern," he says, then pauses. "In a sense, I'm a born killer."



[Enlarge](#)

Courtesy of Jim Fallon

Fallon was prompted to study his brain after his mother, Jenny, told him his ancestry was full of alleged murderers.

Fallon's being tongue-in-cheek — sort of. He doesn't believe his fate or anyone else's is entirely determined by genes. They merely tip you in one direction or another.

And yet: "When I put the two together, it was frankly a little disturbing," Fallon says with a laugh. "You start to look at yourself and you say, 'I may be a sociopath.' I don't think I am, but this looks exactly like [the brains of] the psychopaths, the sociopaths, that I've seen before."

I asked his wife, Diane, what she thought of the result.

"I wasn't too concerned," she says, laughing. "I mean, I've known him since I was 12."

Diane probably does not need to worry, according to scientists who study this area. They believe that brain patterns and genetic makeup are not enough to make anyone a psychopath. You need a third ingredient: abuse or violence in one's childhood.

"And fortunately, he wasn't abused as a young person," Diane says, "so I've lived to be a ripe old age so far."

### **The New World of 'Neurolaw'**

Jim Fallon says he had a terrific childhood; he was doted on by his parents and had loving relationships with his brothers and sisters and entire extended family. Significantly, he says this journey through his brain has changed the way he thinks about nature and nurture. He once believed that genes and brain function could determine everything about us. But now he thinks his childhood may have made all the difference.

"We'll never know, but the way these patterns are looking in general population, had I been

abused, we might not be sitting here today," he says.

As for the psychopaths he studies, Fallon feels some compassion for these people who, he says, got "a bad roll of the dice."

"It's an unlucky day when all of these three things come together in a bad way, and I think one has to empathize with what happened to them," he says.

But what about people who rape and murder — should we feel empathy for them? Should they be allowed to argue in court that their brains made them do it? Enter the new world of "neurolaw" — in which neuroscience is used as evidence in the courtroom.

## comments

Please note that all comments must adhere to the NPR.org [discussion rules](#) and [terms of use](#). See also the [Community FAQ](#).

You must be logged in to leave a comment. [Login / Register](#)

Post this comment to Facebook, too?

**submit**

NPR reserves the right to read on the air and/or publish on its Web site or in any medium now known or unknown the e-mails and letters that we receive. We may edit them for clarity or brevity and identify authors by name and location. For additional information, please consult our [Terms of Use](#).

Recent First



**Q Lee (GotchaLookin)** wrote:

More important, Supreme Court justice candidates should be required by the Senate's Justice Committee to submit neurophysiological medical reports based on functional MRI scans. Reason: Interest in the law is sometimes due to a candidates abnormal interest in the history of crime and its consequences. This may be caused by sociopathic tendencies, which could lead to a lack of empathy towards potential apelants appearing before the Supreme Court. This would be an important annual medical review requirement to be discussed hypothetically during the Elena Kagan Senate Hearings. If a sitting Supreme Court justice suffered a stroke and lost the use of the orbital cortex, should the justice still sit in judgment of cases brought before the Supreme Court?

June 29, 2010 12:19:48 AM PDT

[Recommend \(0\)](#)

[Report abuse](#)



**James Fallon (Fazool)** wrote:

Hi, Jim Fallon here. I'd like to respond to some of the issues brought up in the discussion. Many of the comments below are dead-on and pretty insightful, so much so that I wish that



some of you had been in my medical school and grad school neuroscience classes. But I first need to hear Barb's broadcast tomorrow morning before saying anything.

June 29, 2010 12:12:57 AM PDT

[Recommend \(0\)](#)

[Report abuse](#)



**Q Lee (GotchaLookin)** wrote:

Neurolaw should be obligatory for anyone with access to the chain-of-command for strategic weapons. VP Joe Biden would probably fail to qualify due to the damage to his brain from the strokes he suffered. It does explain his recent verbal outburst in Minnesota. His brain is now "free-wheeling" and does not have effective rational control of his emotions. Rahm Emanuel will have to find a way to ease Biden out of the VP seat.

June 29, 2010 12:07:37 AM PDT

[Recommend \(0\)](#)

[Report abuse](#)



**Kurt Holme (kwillie)** wrote:

I hope "neurolaw" will be used to disqualify the worst offenders from eventual parole, keeping them off the streets, instead of being used as a defense to avoid incarceration.

June 28, 2010 11:50:58 PM PDT

[Recommend \(1\)](#)

[Report abuse](#)



**Bee Bea (BeeBea)** wrote:

Neurolaw sounds dangerously close to pre-crime aka Philip K. Dick.

June 28, 2010 11:25:01 PM PDT

[Recommend \(1\)](#)

[Report abuse](#)



**C B (C\_J\_B)** wrote:

Also, let's not forget the rule of "unlawful search and seizure" - our thoughts and brains are private, and ought not to be examined without due process. Never before in history have official agents been so morbidly intrusive in our personal lives. I hope it's not a trend.

June 28, 2010 10:25:43 PM PDT

[Recommend \(0\)](#)

[Report abuse](#)



**C B (C\_J\_B)** wrote:

There are sociopaths in many walks of life, many of whom do not use violence to get what they want. Part of the problem with violent behavior, I think, has to do with the basal ganglia. We choose to assign emotional values to the consequences of our actions, and some people love money or power more than respect for others.

I sense a little "chicken or the egg" paradox in the works here: are their brains different because of years of criminal behavior, or are they violent because of this apparent abnormality? Tough to decide.

There have been many infamous programs using mind control in the prisons, making the offenders unwilling participants, but these programs will never train the human soul to do good: only God can do that. Meanwhile, they stay in a cage.

June 28, 2010 10:22:13 PM PDT

[Recommend \(0\)](#)

[Report abuse](#)



**jen larsen (schroedingercat)** wrote:

Avi E (Crimanimal) wrote:



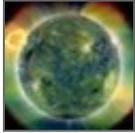
So by proving that he has the pattern yet is not violent isn't he disproving his own research?

no, not really. you can't disprove facts like: a bunch of sociopaths have a pet scan that looks like \*this\*. you can only disprove theories, such as everyone with a pet scan like \*this\* is a sociopath. and he even said he has now disproved his own personal theory... so... no. he didnt disprove his research. :)

June 28, 2010 9:48:20 PM PDT

[Recommend \(2\)](#)

[Report abuse](#)



**Frosted Flake (Frosted\_Flake)** wrote:

"Should they be allowed to argue in court that their brains made them do it?"

I am worried about the opposite approach : The prosecutor waves an indefinable image at the Jury and all but screams, "SEE? HE'S A KILLER!" The defence leaps to his feet and says, "Objection, Your Honor! This case is about alledged SHOPLIFTING!" The Judge pretends to consider a moment, then says, "Overruled." The gavel drops. The Jury convicts. Votes the Death Penaly.

Quack science is nowhere near as expensive as quack law. This coming from ME.

I am the guy whose first mission upon leaving home was to look under every rock on the path that had lead me where I was (NOWHERE) to see what was underneath. Then either put the rock back, or throw it as far away from me as I had the strength to send it.

2nd point : Jeanne Patterson doesn't know what a PET scan is. Positron emmission tomography uses radiotraced sugar to indicate on screen where metabolic activity is higher and where it is lower. In a brain scan, it shows what parts of the brain are more active and which are not, WHEN the photo was snapped.

3rd point : A snapshot of a man walking is not distinguishable from a snapshot of a man stepping. Let's be careful NOT to draw conclusions from a snapshot.

June 28, 2010 9:36:12 PM PDT

[Recommend \(1\)](#)

[Report abuse](#)



**Debra Williams (debralovesgospe)** wrote:

Jeff asks "will our jails become mental health wards?"

Dear they already are.

June 28, 2010 9:16:14 PM PDT

[Recommend \(6\)](#)

[Report abuse](#)

[View all comments \(88\)»](#)