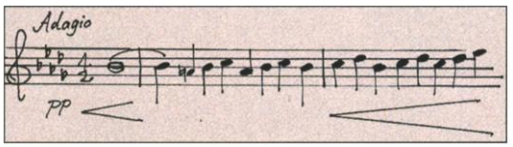
Music's Gut Reaction

Music, both beautiful and unpleasant, evokes clear physiological responses and may tap into our deepest instinctual drives, according to Canadian neuroscientists.

In a study exploring the brain circuitry behind people's emotional responses to music, Anne Blood and Robert Zatorre at the Montreal Neurological Institute looked at reactions to intensely pleasurable pieces, defined as the kind that sends chills up one's spine. In the study, five male and five female musicians were asked to choose their most chill-raising compositions. As they listened to the music, which included Samuel Barber's "Adagio for Strings" and Rachmaninoff's third piano concerto, the scientists measured autonomic responses—heart rate, respiration, and muscle contraction—as well as brain activity via positron emission tomography.



The team found that when physiological monitors registered "chills"—indicated by quickened autonomic activity—subjects' brains reacted in the same areas that are associated with emotion, arousal, and reward from food, sex, and drugs of abuse.

"This is an enlargement of the category of stimuli, not directly related to survival, that can activate instinctual systems in the human brain," says neuropsychologist Chantal Martin-Solch of the University of Basel in Switzerland, who has done brain studies on the effects of money, tobacco, and drugs. Music, like those stimuli, "doesn't have a direct evolutionary survival value in the way food and sex do," Blood notes. Instead, "music's value became cultural and got passed along because it evokes similar positive responses."

The work, reported in the 25 September issue of the *Proceedings of the National Academy of Sciences*, extends previous experiments showing that dissonant musical excerpts flipped on brain centers related to learning, memory, and anxiety—totally different from regions triggered by the pleasant strains.

Because it is so intimately linked to emotions, both positive and negative, says Blood, now at Massachusetts General Hospital in Boston, "music offers a really good tool for studying emotion in an experimental setting."

Marijuana, Cocaine Share Circuitry

A drug that blocks the pleasurable effects of marijuana also seems to block craving for heroin and cocaine—at least in rats, according to a new study.

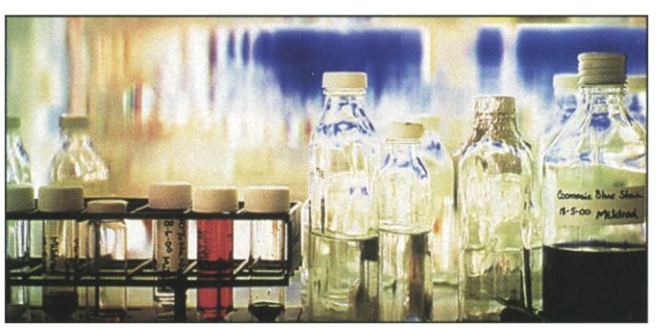
The unexpected discovery concerns a compound known as SR141716A, which blocks a family of brain receptors that responds to the active ingredient in marijuana. People given SR141716A don't get high from marijuana. What's more, they also lose interest in food and drink. This led Taco de Vries and his colleagues at Vrije University in Amsterdam, the Netherlands, to suspect that marijuana receptors might have a deeper link to the brain's reward and craving pathways.

To see if this was the case, they turned to cocaine. First they made cocaine-addicted rats go cold turkey for 2 weeks. They then gave the rats a small injection of cocaine along with either a dose of SR141716A or a control solution. The rats given SR141716A seemed relatively blasé about the drug fix: They pushed the button that previously supplied cocaine less than half as often as control rats did. Heroin-addicted rats responded the same way, the researchers report in the October issue of *Nature Medicine*.

It's "very novel" work, says addiction researcher Charles O'Brien of the University of Pennsylvania in Philadelphia. He says the finding may ultimately help scientists design a single therapy that helps fight addiction to many different drugs.

Good Chemistry

Artists have been mixing it up with chemists lately at the University of Oxford. Four artists have completed residencies at the newly built home of the Sir William Dunn School of Pathology, which officially unveiled their work this week. The rows of bottles are part of a triptych done by photographer Catherine Yass using as her subjects the bottles in the lab of chemist William James.



CREDITS: (BOTTOM) CATHERINE YASS, "DOUBLE AGENT 2001" (DETAIL)

Mouse-Free Stem Cells

Researchers in California say they have figured out how to cultivate human embryonic stem (ES) cells without exposing them to mouse cells. That, they say, opens the door to large-scale production of cells, one prerequisite for their ultimate use in fighting diseases such as Parkinson's and juvenile diabetes.

All the ES cell lines available for research today have been cultured using "feeder" cells from mouse embryos, which supply a complicated array of chemicals needed both to nourish proliferating cells and to sustain them in an undifferentiated—or pluripotent—state. Scientists at Geron Corp. in Menlo Park now report in the October issue of *Nature Biotechnology* that they've perfected a "feeder-free" recipe combining a commercial preparation called Matrigel with a "conditioning medium" that has been exposed to mouse cells so that it picks up important ingredients but not the cells themselves.

The researchers, led by Melissa Carpenter, say their culture system has sustained cell populations that retain all the signpost characteristics of stem cells for as many as 130 doublings.

With no mouse cell worries, "they can probably grow vats" of ES cells now, says Steven Goldman, a professor of neurology at Weill Medical College of Cornell University in New York City. Ronald McKay, a stem cell researcher at the National Institutes of Health in Bethesda, Maryland, says no one knows just how mouse cells work their magic, so the success of the project is "a step toward defining a simple chemistry that maintains the cells in the undifferentiated state."