

Alcoholism exposes its 'insensitive' side

Some young men down as many as five alcoholic drinks in a row and experience few, if any, intoxicating effects. This trait, a valued sign of imbibing prowess in some circles, greatly boosts a man's chances of developing alcoholism by age 30, according to results of a longitudinal study.

Low sensitivity to modest amounts of alcohol — as indicated by the relative absence of feelings of intoxication and good performance on a test of coordination and balance — shows a strong link to future alcoholism among the sons of both alcoholic and nonalcoholic fathers, asserts Marc A. Schuckit, a psychiatrist at the University of California, San Diego, Medical School.

In previous studies, Schuckit found that about 40 percent of sons of alcoholic fathers display dampened reactions to the equivalent of either three or five alcoholic drinks, compared to 10 percent of nonalcoholics' sons. Those investigations comprised 454 men, all about age 20 at the time.

His new report, published in the February *AMERICAN JOURNAL OF PSYCHIATRY*, charts alcohol consumption among 222 of these men about 10 years later; data on the rest of the volunteers are still being analyzed. Schuckit also obtained measures of hormone responses to alcohol from these men.

"We're publishing the findings now because they're pretty dramatic," Schuckit maintains. "From what I've seen so far, the results don't change in the second half of the sample."

Follow-up evaluations consisted of separate face-to-face interviews with each participant and his wife or another person who knows him well, medical record checks, and screening of urine and blood for evidence of heavy alcohol drinking.

At age 30, alcoholism afflicted 43 percent of those who showed the least response to alcohol, compared to only 11 percent of those deemed most sensitive to alcohol. Each of these groups made up a fifth of the sample.

Alcoholism occurred among 56 percent of sons of alcoholics on the low end of sensitivity to alcohol. That figure fell to 14 percent among the most-alcohol-sensitive men with alcoholic fathers. A smaller, but statistically significant, disparity in alcoholism rates associated with alcohol sensitivity emerged in sons of non-alcoholics.

Although participants experimented with a variety of drugs during their 20s, neither an alcoholic father nor insensitivity to alcohol showed a link to full-fledged abuse of any substance other than alcohol, Schuckit asserts.

Moreover, men who exhibited weak responses to alcohol at age 20 did not develop additional psychiatric disorders by age 30, he contends.

"Schuckit's study provides more evidence that there are specific vulnerabilities to alcohol abuse and nothing else," holds Donald W. Goodwin, a psychiatrist at the University of Kansas Medical Center in Kansas City.

Corroborating evidence comes from an ongoing 40-year study of a large Danish sample, conducted by Goodwin and his coworkers, and a 50-year study of men in the United States (SN: 6/5/93, p.356).

Several genetic studies suggest that some people inherit a propensity for abusing a wide variety of drugs, although

independent attempts to confirm these results have failed (SN: 11/14/92, p.332).

Further genetic research may need to focus on low-sensitivity alcoholics and their families, Schuckit suggests.

The San Diego researcher notes that an estimated 15 percent of alcoholics also display symptoms of antisocial personality disorder, such as constant irresponsible and aggressive behavior. However, alcoholic fathers in his study did not suffer from that disorder or any other psychiatric condition, he says.

In a heavy-drinking society, low sensitivity to alcohol may be an initial link to a chain of events that leads to uncontrolled drinking, Schuckit theorizes. — *B. Bower*

Linking particles, waves, and uncertainties

At the heart of quantum mechanics lies the notion that quantum objects such as electrons, photons, and atoms behave both like waves and like particles. However, according to the complementarity principle formulated by Niels Bohr, it's impossible to observe both wave and particle characteristics at the same time. The act of observation itself causes the quantum object to assume either its wave or particle guise.

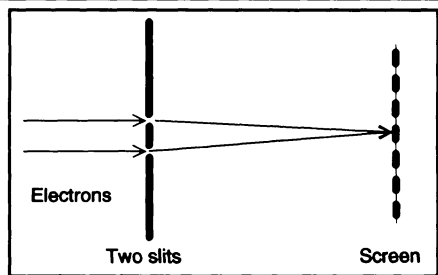
Quantum mechanics also incorporates Werner Heisenberg's uncertainty principle, which establishes that it is impossible to determine simultaneously both the momentum and the position of a quantum object with perfect precision. If one can measure an object's position with absolute certainty, then its momentum is completely unknown and vice versa.

In many instances, physicists have shown that the uncertainty principle is responsible for the difficulty of observing both particle and wave behavior at the same time. Measuring an object's position makes its momentum unpredictable, and such momentum changes wipe out the object's wave-like properties. Hence, complementarity is a consequence of the uncertainty principle.

But it hasn't been clear whether this is always the case. Now, physicist Daniel F. Walls and his colleagues at the University of Auckland in New Zealand show theoretically that this relationship between the complementarity and uncertainty principles must hold in any experiment in which a quantum object passes through a closely spaced pair of slits in a barrier.

Walls and his coworkers report their findings in the Feb. 17 *NATURE*.

In the classic double-slit experiment, quantum objects such as electrons must pass through two slits to get to a screen (see diagram). Because electrons can act like waves, they create a striped interference pattern on the screen (corresponding to where the waves cancel and reinforce each other) instead of just a pair of stripes directly in line with the slits.



Double-slit quantum interference experiment.

However, any attempt to put a detector along an electron's path to pinpoint which slit the electron travels through destroys the interference pattern. A researcher ends up observing either the interference pattern or the electron's path, but not both at once.

In 1991, Marlan O. Scully of the University of New Mexico in Albuquerque and his collaborators suggested a type of double-slit experiment involving atoms and lasers in which the interference pattern disappears and an atom's path is detected, apparently without transferring momentum to the atom. On this basis, the researchers suggested that complementarity is an independent component of quantum mechanics. It need not always follow from the uncertainty principle.

Walls and his coworkers argue that in a double-slit experiment, the amount of momentum transferred by the detector to a quantum object depends on the distance between the two slits, in accordance with the uncertainty principle. If less momentum is transferred, the object's path cannot be determined with certainty, and the object retains wave-like characteristics.

Scully and his colleagues had overlooked the momentum kicks, which come from the repeated emission and absorption of photons by an atom, that are needed to wipe out the atom's wave-like behavior, Walls and his group conclude. The uncertainty principle still rules.

— *I. Peterson*