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## The Rational Approach to the Irrational

Last week a crazed gunman terrorized hostages in a bar in Berkeley, killing one and wounding many others. Homicidal maniacs have appeared in all cultures over the entire length of human history. Society's modern response to their chaotic behavior has most often been a diligent search of their childhoods, as though understanding their upbringing and circumstances would explain their aberrant actions. There is nothing wrong with that kind of investigation, and in some cases history and environment will reveal clues. However, it is time the world recognized that the brain is an organ like other organs—the kidney, the lung, the heart—and that it can go wrong not only as the result of abuse, but also because of hereditary defects utterly unrelated to environmental influences. Some inherent defects may be exacerbated by environmental conditions, but the irrational output of a faulty brain is like the faulty wiring of a computer, in which failure is caused not by the information fed into the computer, but by incorrect processing of that information after it enters the black box.

This issue of *Science* is illustrative of the kinds of research that can offer great help to society in this area. Today research in the neurosciences is flourishing, as exemplified by eight reports that span the area from molecular manipulation of ion channels to a study of primate behavior to a study of human twins. This rapid progress is aided by advances in the social sciences in general and the advent of three major new tools. The first is genetic engineering, and the second, the noninvasive physical probes for imaging the brain. The third is the Human Genome Project, which will provide information of particular value to the study of the neurosciences. The ability to combine analyses of structural changes in the genome with family histories has already provided valuable insights into neurological disorders, of which Huntington's disease, neurofibromatosis, and Alzheimer's disease are only a few examples. There are legitimate arguments in regard to how fast such a project should go or how it should be administered, but there seems to be little doubt that it will help in the mental health area. Schizophrenia (the disease from which the Berkeley gunman is thought to have suffered) and other major mental illnesses can have a multigenic origin. A sequenced human genome will be a very important tool for understanding this precise category of diseases.

As a special feature in this issue, *Science* presents a human genome map that can be used as a wall chart, together with an accompanying article by J. C. Stephens *et al.* This map, which records the state of the art in sequencing, mapping, probes, and polymorphisms will not only allow researchers in the field to identify their own particular opportunities, but keep others abreast of the rapid advances in this area. An article in the Research News section illustrates the history that has brought us to this point in discovery. Technological advances in genome analysis are also described in scientific papers in this issue.

As we extend the life expectancy of individuals and provide cures for infectious diseases, the affliction of mental disease becomes more glaring. Advancing research can cure some fraction of these illnesses. It may also provide predictive diagnoses to distinguish those who are severely ill from those who merely represent harmless aberrations from the norms of society. The article on identical twins reared apart shows that some physiological and psychological traits are inherited; however, this does not minimize the influences of environment and motivation. While some inherited illnesses cannot be alleviated without a biochemical cure, in others there is only a tendency to disease, which can be ameliorated or prevented by a helpful environment.

The combination of new tools may not only let us help in reducing crime, but also aid some of our most disadvantaged citizens, the mentally ill. Although increased funding of mental health centers, stricter gun control, increased supervision of the mentally unbalanced, or higher standards for probation officers may be desirable, they are Band-Aid remedies. In the long run, the solution will be found in the knowledge required to produce accurate diagnoses and cures. The research to provide that knowledge will be far cheaper, and the results much fairer, than Draconian law enforcement.—DANIEL E. KOSHLAND, JR.