CONTRIBUTIONS *of* SOCIAL *and* BEHAVIORAL SCIENCE RESEARCH *to* ISSUES *of* NATIONAL SIGNIFICANCE

The following pages include summaries of social and behavioral science research projects that have yielded important results for national security, public health and safety, and the economy.

ADDRESSING PUBLIC HEALTH

Youth Smoking Prevention. Adolescents tend to be more powerful in influencing their friends to start smoking than in helping them to quit, according to Penn State sociologists. In a study of adolescent friendship networks and smoking over time, the researchers found that friends exert influence on their peers to both start and quit smoking, but the influence to start is stronger because of availability of tobacco. While most current adolescent smoking prevention programs are aimed at building resistance to peer pressure, the study shows that school nurses and other health professionals may be able to design programs that use peer pressure to positively to influence behavior. For example, they could design programs to help nonsmoking adolescents help their smoking friends.

Preventing the Spread of Flu in Schools. Stanford University social scientists investigated methods to prevent the spread of flu-like infectious disease in school settings. Every student, teacher and staff member of one high school was outfitted with a credit card-sized wireless sensor to monitor contact for one whole school day and model social networks. The resulting models simulated how influenza infection would spread through the community based on real-world contact. The models also allowed researchers to explore strategies for deficient disease management such as vaccinations and school closings. Most vaccination strategies were no more effective than random vaccinations in preventing the spread of disease. However, social distancing strategies in which schools were intermittently closed (e.g., two days open, two days closed) interrupted the contact network, and were nearly as effective as a complete three-week school shutdown. These findings provide useful insight for school administrators and public health officials into the development of effective prevention strategies.

Organ Donation Matching. To address the high demand for kidneys and the challenge of finding a donor, economists have developed algorithms to facilitate kidney matching for patients who have willing but biologically incompatible donors. Based on their knowledge in game theory and market dynamics, a team of researchers from Harvard University, Boston College, and the University of Pittsburgh developed powerful match-making software that optimizes the process of identifying an appropriate live donor match with compatible blood types and antibodies. This system creates kidney exchanges that match an incompatible donor-patient pair with a similarly incompatible pair so that each of the patients receives a kidney from a compatible donor. The medical programs that use this software have already saved many lives nationwide. The researchers are now investigating the increased efficiency between two-way and three-way matches, as well as more extended transplant chains. Alvin Roth of Harvard was a co-recipient of the 2012 Nobel Prize in Economic Sciences for his research on the practical applications of matching theory.

CONTRIBUTING TO NATIONAL DEFENSE & SECURITY

Nonverbal Communication to Transcend Language Barriers. A Washington University in St. Louis researcher and collaborators investigated emotion recognition using nonverbal cues such as facial expressions, vocal tones and body language. Based on this research, the Army Research Institute now incorporates education on nonverbal communication into soldier training, thereby assisting troops in understanding cross-cultural, nonverbal communication with non-English speaking citizens with whom they interact overseas. Thus, this research has the potential to provide human solutions in military situations. Enhancing troops' interpersonal skills can enable them to anticipate and diffuse conflict, as well as facilitate cooperation, negotiation and compromise.

Improving Port Security by Maximizing Efficiency. To ensure the safety of U.S. ports, a reliable process to inspect the millions of shipping containers that pass through U.S. ports each year is required. While several types of tests are available to inspect cargo and detect dangerous or illicit substances, including nuclear materials, developing a system that maximizes inspection efficiency while minimizing costs is a challenge. Researchers at Rutgers University considered these factors in developing new algorithms to improve port safety. These algorithms identified optimal decision-making for shipping container screening by analyzing types of inspection tests and shipping manifests. These tools not only have the potential to increase cost-effective methods of hazardous materials detection, they also can benefit decision-making in other areas such as public health.

THE COMMUNICATIONS REVOLUTION

Game Theory Revolutionizes Telecommunications. NSF-supported researchers provided the Federal Communications Commission (FCC) with its current system for apportioning the airwaves via a fruitful, practical application of game theory and experimental economics. Since their inception in 1994, FCC "spectrum auctions" have netted over $60 billion in

revenue for the federal government. As wireless communication blossomed in the early 1990s, the FCC received a concomitant increase in requests to use the limited commercial frequencies of the electromagnetic spectrum. The upsurge rendered the FCC's lottery-based licensing method inadequate, but economists Paul Milgrom and Robert Wilson of **Stanford University**, and collaborator Preston McAfee had a solution: an auction system based on their research. The team's NSF-funded studies had already documented conditions under which the proposed spectrum auction was expected to perform well, and experiments in NSF-supported labs run during the FCC's decision-making process provided additional evidence that the new system surpassed the proposed alternatives. The U.S. system of partitioning airwaves is now emulated in several other countries around the world, resulting in **total worldwide revenues in excess of $200 billion**.

ENSURING PUBLIC SAFETY

Keeping Tabs on Sex Offenders, Keeping Kids Safe. A team of researchers from **Drexel University**, **Indiana University,** and **Arizona State University** developed **spatial models to help manage the location of sex offenders**. Their research addressed concerns regarding the impact of sex offender residency laws on a community, as their end results are often unknown. They considered important factors such as whether residency restrictions lead to high concentrations of offenders in specific areas, distribute the risk across a community equitably, and keep sex offenders from living near minors. **These modeling techniques can provide legislators, law enforcement and public policy officials with the unique ability to make informed decisions about new policies prior to their actual implementation.** Thus, improving the development and evaluation of sex offender residency policies in advance of any legislation will allow public officials the opportunity to consider the resulting distribution of offenders in terms of local residents, better meeting the needs of communities.

Using Modeling to Cut Crime. With support from the National Science Foundation, a team of anthropologists, criminologists, and mathematicians at the **University of California, Los Angeles** created a mathematical computer simulation model of **crime pattern formation**. The model revealed that additional policing in certain crime "hot-spots" resulted in two alternate responses: relocation of the criminal activity to different areas or complete disbanding of the activity. In 2010, those **researchers collaborated with police departments** in Santa Cruz and Los Angeles to map crime hot spots in those cities. Their findings are helping police predict when crime can be suppressed by intensified police actions and when crime might merely be displaced to other neighborhoods. **As a result of this research, burglaries in Santa Cruz declined by 19% over a six-month period.** In 2011, *Time* magazine included predictive computer modeling as one of its *50 Best Inventions* for that year.

MANAGING NATURAL RESOURCES

Managing Natural Resources through Cooperation. Elinor Ostrom of **Indiana University** challenged conventional

wisdom and long-held theories on how best to **manage common natural resources**. She explored the role of **cooperation among people and the impact on overall economic benefit**, especially during a time of increasing global population and subsequent strain on available resources. Ostrom investigated efficient management of shared community resources such as forests, fish and water. She found that cooperative management of these resources by individuals, compared to outside agencies such as governments or private companies, can be highly efficient, resulting in greater sustainability and mutual economic benefit. **Ostrom is the first, and thus far only, woman to be awarded the Nobel Prize in Economic Sciences (2009)**.

UNDERSTANDING HUMAN DECISION-MAKING

Making Good Choices Easier. Daniel Kahneman's (**Princeton University**) pioneering work in **behavioral economics** addressed how people make decisions when presented with potential risks and uncertain outcomes. He challenged standard economic theory that depicted people as largely rational and logical decision-makers in these situations. Kahneman demonstrated that the way information is presented can strongly influence people's decision-making. Such information framing is also referred to as "anchoring." Kahneman is known, too, for his work on prospect theory, in which he and collaborator Amos Tversky investigated how people make decisions, especially with respect to finances, when presented with alternatives that have known outcomes regarding gain or loss. They found that people often make predictably irrational decisions, due in part to a disproportionate aversion to losses compared to their level of desire for gain and a tendency to deny true risks that carry the potential for negative outcomes. **Kahneman received the Nobel Prize in Economic Sciences in 2002**, the first psychologist to win the award in economics.

Advancing Democracy. In 2010, the **University of Michigan** and **Stanford University** received a total of $10 million as part of the **American National Election Studies** (ANES) project to inform explanations of **election outcomes**. [The] goal is to support the legitimacy and vibrancy of American democracy by producing credible measures of individuals' relationship to their government and to their country. For over 60 years, researchers have used this data to clarify many important aspects of how people feel about past actions of government, and how such feelings affects their willingness to contribute to society in a range of different ways, from the workplace, to the ballot box, to a range of volunteer organizations. The ANES is used by tens of thousands of scholars, teachers, journalists, and citizens around the world to not only better understand the current state of American democracy, but to compare the present to the past. Moreover, the ANES studies are **considered a benchmark for election surveys around the world**. In established democracies and new democracies, **National Election Studies support governmental legitimacy** by providing powerful and valid measures of the factors that affect citizens' feelings about, and contributions to, the nations in which they live.