

# SCIENTIFIC AMERICAN



## TRENDS

### Entrepreneurial Global Health

Green Cars

Alzheimer's Treatments

Plasmonics

Stem Cells

Smart Tags

Carbon Electronics

Tissue Engineering

Robotics

DNA Sequencing

Cool Materials

Vision Prosthetics

A group of scientists have detailed how to create materials that can redirect light around an object and make it invisible. This possible precursor to the ultimate camouflage demonstrates the depth of ingenuity of the 2006 SCIENTIFIC AMERICAN 50 awards.

These accomplishments go beyond invoking the Invisible Man. Drawn from the worlds of research, business and policymaking, a good number of the names on our list have in common an interest in leading technological innovation as a force for the public good: A fundamental understanding of the molecular processes that produce the mind-crasing devastation of Alzheimer's. A hybrid car that recharges by simply plugging into the wall. A billionaire who gives up much of his fortune to improve the state of global health.

Some of the inventions of this year's winners may soon be found at big retailers or in hospital dispensaries. Yet many of the researchers garnering accolades concentrated on basic questions, occupying themselves, for instance, with learning about the mechanisms that transform one stem cell type into a more specialized cell type—knowledge that will help answer the critical question of whether these wondrous biological entities will ever prove useful in clinical practice. Throughout the list of winners, that same theme reasserts itself: the most fundamental science precedes the technology that is eventually put to service in treating Alzheimer's or fashioning new devices that might outperform silicon electronics.

TECH LEADERS: THE SCIENTIFIC AMERICAN 50 FOR 2006  
NANOELECTRONICS, STEM CELLS, ROBOTICS AND MORE

# SCIENTIFIC AMERICAN



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### The Promise of the Mother Cell

Stem cell biology continues to hint at medical benefits to come

A recent research trend has targeted the goal of having one's stem cells and preserving embryos, too—a nod to powerful critics such as President George W. Bush. Even if an embryo remains intact—the objective of these studies—it is unclear whether these methods will ever satisfy Bush and others who rail against what they perceive as immoral tinkering with the stuff of life.

Kevin Eggan and his colleagues at the Harvard Stem Cell Institute brought together embryonic stem cells with skin cells, or fibroblasts, creating fusion cells that reprogrammed themselves to resemble embryonic stem cells genetically matched to the donor of the skin cell. These cells would have the versatility to turn into any other cell type—and would not require a cloning procedure that necessitates the destruction of an embryo.

The promise of stem cells was again reaffirmed by an experimental therapy to treat patients with lupus—a disease

in which the patient's immune system targets the body's own tissue. A group led by Richard K. Burt of the Northwestern University, Feinberg School of Medicine, removed stem cells from the patient's bone marrow. Drugs then wiped out the population of white blood cells before the stem cells were returned to the body, where they formed new white blood cells that were less likely to make damaging antibodies. In a study of 48 patients, half did not have the disease after a period of five years.

Determining how an embryonic stem cell differentiates into mature cells might eventually allow development of methods to reprogram an adult cell. Those techniques might let the mature cell return to its pluripotent state, in which it is capable of turning into different cell types. Laurie A. Boyer and Richard A. Young of the Whitehead Institute for Biomedical Research and their colleagues demonstrated how three proteins control this process.

**Richard K. Burt, MD**  
Scientific American 50 Award for Advancing  
Humanity Due to His Work in Stem Cells

SA 50

SA 50 WINNERS AND CONTRIBUTORS

**Research Leader of the Year**

1. Angela Belcher, Massachusetts Institute of Technology

**Business Leader of the Year**

2. Swiss Re

**Policy Leader of the Year**

3. Vice President Al Gore

**Other Research, Business and Policy Leaders More Than Government Grants**

4. Michael Kremer, Harvard University (policy)
5. Scott Johnson, Myelin Repair Foundation (policy)
6. Kathy Giusti, Multiple Myeloma Research Foundation (policy)
7. Christiane Nüsslein-Volhard, Christiane Nüsslein-Volhard Foundation (policy)
8. Warren E. Buffett, investor/philanthropist (policy)

**On the Road to Green**

9. Iogen Corporation (business)
10. Michikazu Hara, Tokyo Institute of Technology (research)
11. DaimlerChrysler (business)
12. General Motors, DaimlerChrysler and BMW (business)
13. EDrive Systems and Hymotion (business)

**Unlocking Alzheimer's**

14. John R. Cirrito and David M. Holtzman, Washington University in St. Louis School of Medicine (research)
15. Randall J. Bateman and David M. Holtzman, Washington University in St. Louis School of Medicine (research)
16. Robert P. Hammer, Louisiana State University (research)

**Beginning to See the Light**

17. Igor I. Smolyaninov, University of Maryland (research)
18. John B. Pendry, Imperial College London, David Schurig and David Smith, Duke University, and Ulf Leonhardt, University of St. Andrews (research)
19. Nader Engheta, University of Pennsylvania (research)

**The Promise of the Mother Cell**

20. Kevin Eggan, Harvard Stem Cell Institute (research)
21. Richard K. Burt, Northwestern University, Feinberg School of Medicine (research)
22. Laurie A. Boyer and Richard A. Young, Whitehead Institute for Biomedical Research (research)
23. Susan L. Lindquist, Whitehead Institute for Biomedical Research (research)
24. Representative Diana DeGette of Colorado and Representative Mike Castle of Delaware (policy)

**Smart Tags Get Smarter**

25. IMEC (business)
26. Eugenio Cantatore, Philips Research Laboratories (business)
27. Hewlett-Packard Laboratories (business)

**Chicken-Wire Electronics**

28. Andre K. Geim, University of Manchester, and Philip Kim, Columbia University (research)
29. Walter de Heer, Georgia Institute of Technology (research)
30. Prabhakar R. Bandaru, University of California, San Diego (research)
31. Ray H. Baughman, Mei Zhang and Shaoli Fang, NanoTech Institute, University of Texas at Dallas (research)

**Growing Replacement Parts**

32. William R. Wagner and Michael S. Sacks, University of Pittsburgh (research)
33. Cytograft (business)
34. Shulamit Levenberg, Technion-Israel Institute of Technology

**Robots on the Move**

35. Stanford Racing Team (research)
36. Jessy W. Grizzle, University of Michigan at Ann Arbor (research)

**DNA Sequencing on the Cheap**

37. George M. Church, Harvard Medical School (research)
38. 454 Life Sciences (business)
39. H. Kumar Wickramasinghe, IBM Almaden Research Center (business)

**Material Progress**

40. Natalia Dubrovinskaia, University of Bayreuth (research)
41. Pulickel M. Ajayan, Rensselaer Polytechnic Institute (research)
42. Antoni P. Tomsia, Lawrence Berkeley National Laboratory (research)
43. Daniel E. Morse, University of California, Santa Barbara (research)

**Sight Savers**

44. Larry I. Benowitz, Children's Hospital Boston (research)
45. Elizabeth Goldring, Center for Advanced Visual Studies, Massachusetts Institute of Technology (research)
46. Protagoras Cutchis, Johns Hopkins University (research)

**Of Brain Maps and Saving the Internet**

47. Christopher Monroe, University of Michigan at Ann Arbor, and David J. Wineland, National Institute of Standards and Technology (research)
48. Timothy Wu, Columbia University (policy)
49. Andrew J. Turberfield, University of Oxford (research)
50. Paul G. Allen, Allen Institute for Brain Science (research)

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October 25, 2006

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Dear Dr. Burt:

Congratulations. The Board of Editors of *SCIENTIFIC AMERICAN* magazine is pleased to announce that it has selected you for inclusion in the fifth annual *SCIENTIFIC AMERICAN 50*. This award from *SCIENTIFIC AMERICAN* honors 50 individuals, teams, companies and other organizations whose accomplishments in research, business or policymaking during 2005 – 2006 demonstrate outstanding technological leadership.

The honorees are celebrated for their contributions to a wide variety of areas, such as such as biotechnology, microelectronics, energy and genetics. Winners over the past several years have included Larry Page and Sergey Brin, founders of Google (sharing the distinction of 2005 Business Leader of the Year), research philanthropist Fred Kayli (2005 Policy Leader of the Year), renowned stem cell researcher Douglas A. Melton, Professor of the National Sciences at Harvard (2004 Policy Leader of the Year); and Nobel prize-winning neurobiologist Roderick MacKinnon, Professor of Molecular Neurobiology and Biophysics of Rockefeller University (2003 Research Leader of the Year).

We are delighted to say that you emerged as a winner for your research contributions to stem cell research.

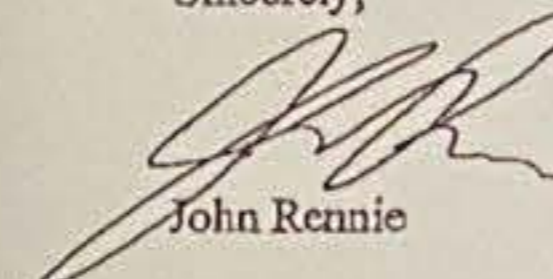
The complete list of winners for the SA 50 will appear in the December 2006 issue of *SCIENTIFIC AMERICAN*.

The formal announcement of the SA 50 winners will be on Monday, November 6, shortly before the newsstand publication of our December issue. We ask that you please treat your inclusion in the list as **HIGHLY CONFIDENTIAL** until that date, so that we may organize publicity for maximum effect.

Please be sure to see the enclosed detailed instructions on how to release your announcement, as well as a template press release. Please be sure to pass on these materials to your public relations representative.

We hope that you will be pleased to be among this year's SA 50. Congratulations from all of us at *SCIENTIFIC AMERICAN*, and thank you for the many contributions that made this a well-deserved honor.

Sincerely,



John Rennie

JR/inh

Encl.

**Richard K. Burt, MD**  
*Scientific American 50 Award for Advancing  
Humanity Due to His Work in Stem Cells*