

Making the Circle Bigger— **TECHNOLOGY**

The Greater Good

James L. Koch

with an Overview of
The Tech Laureates
Venture Network

Howard Neff



Technology and the Special Problem of Poverty in our Networked World

Globalization has dramatically increased the flows of commerce, capital, technology, and people. It has also increased the importance of global information and communication networks as a means of coordinating complex systems of supply and distribution across open market economies. For organizations in the developed world, modern information and communications technology (ICT) and efficient global transportation networks have reduced transaction costs, lowered production and distribution costs, and increased returns to scale. Entrepreneurial efforts in a number of developing economies have also benefited from our networked world through increases in the cross-cultural flow of knowledge and technology transfers.

Beyond the G-7 countries, a growing diaspora has catalyzed knowledge-sharing communities that transcend global boundaries and yielded tremendous economic development benefits for Taiwan, South Korea, Singapore, Malaysia, India, and China.¹ These countries have succeeded in transitioning from initial advantages in low cost production, to leveraging this advantage with the added benefit of access to the large and growing markets associated with rising per capita incomes, to combining these advantages with increasing know how in the development of world class technologies. Their economies, along with those of upstart examples like Ireland and Israel, have joined the G-7 countries on the world stage of nations that are benefiting from advances in science and acceleration in the commercialization of technology. They stand in marked contrast to most of the broader global landscape.

In a May 2002 speech to mayors from developed and developing nations, World Bank President James Wolfensohn underscored the stark disparities that exist in our world.²

“We start, of course, with a world that is six billion people of whom five billion live in developing countries. It is not an equal world. It is a world in which half of the population lives on under \$2 a day, and in which one fifth of the population lives on under \$1 a day. It is world in which the one billion people in the developed world have eighty percent of the income, and in which the five sixths of the world that lives in the poor countries have 20 percent of the income. It is a world in which poor people are concerned about living; they are concerned about all the same things that everyone in this room is concerned about. They are concerned about living in safety. They are concerned about educating their children. They are concerned if they are women about being beaten and about having opportunities. They are concerned about injustice and they are concerned about corruption.

We studied 60,000 poor people, and very few of them mention money. They mention a desire to have life, and few of them mention charity. The three billion people in the world that live on under \$2 a day are not looking for charity, they are looking for an opportunity. They are not looking for someone to give them a handout, they are looking to try and

help themselves to create a better life. This study moved me deeply because it meant for me that the place to solve the issues was, of course, with macroeconomic plans and giant programs, but most significantly to solve issues at the level of people . . .

In the next twenty-five years the world grows from six to eight billion people, and all but fifty million people go to developing countries. So that on the twenty-fifth meeting of the Glocal Forum, someone will say—the world today has eight billion people. Seven billion of them live in developing countries and one billion of them live in developed countries. . . And what will they be saying about poverty? Will they be saying that the share of the wealth is now more proportionally distributed? Will they be saying that four billion people live on under \$2 a day? If they are saying that, I can assure you there will not be peace in the world in which these people are living. . . The issue of poverty is really the issue of peace, and the way to deal with it is not in theoretical discussions, it is at the face of the provision of services and at the face of the creation of communities.”

As Wolfensohn's comments on world poverty suggest, the urgent challenges of our world will grow in scale and complexity. Intractable poverty, disease, and illiteracy, for example, can contribute to a “vicious cycle” by undermining the political stability of developing nations and their capacity to create viable foundations for sustainable growth. Similarly, in an interconnected world where hedge funds and other global financial instruments sprout like dandelions and high-speed networks facilitate herd-like instincts in electronic trading, unprecedented capital flows add volatility and uncertainty to economic development initiatives. These flows can threaten wider-scale contagion as they did in the 1997 Asian financial crisis and, in turn, trigger the macro-economic “prescriptions” of higher interest rates and fiscal austerity that have a disproportionately adverse impact on the poor. This further undermines the grass roots capacity building that is essential to economic development (see, for example, Joseph Stiglitz, *Globalization and Its Discontents*³). So it is that the issue of poverty is intertwined in a larger system that encompasses social and political stability, macroeconomic policy, cross-national institutional arrangements, and peace keeping in our interconnected world.

At the ground level of everyday living, the unmet challenges of poverty tear away at the fabric of a society—undermining human dignity, criminalizing youth, and—in some instances—fanning fundamen-

talist hatreds of modernity (see, for example, Thomas L. Friedman, *The Lexus and the Olive Tree*⁴). September 11, 2001 is an indelible reminder that technology can be appropriated for both good and evil, and that there are no impermeable boundaries in our interconnected world. The unmet challenges of poverty undermine peace, security, and freedom for all of humanity. In many respects the Tech Museum Awards are like a clarion call. They celebrate the genius of those who are applying technology to the most urgent of concerns for *all* of humanity. They are working to make the circle bigger and more inclusive when it comes to utilizing technology to improve the quality of life for all of our brethren.



The Tech Museum Awards

Much like the oil that powers the industrial infrastructures of developed economies, the impact of science and technology on society varies for many reasons in different parts of the world and, within nations, for different segments of society. The Tech Museum Awards are about the pioneering work of innovators who are developing and applying advances in science and technology to solve complex and urgent problems—in the areas of health, education, equality, economic development, and the environment—wherever they exist in our world. Their work is distinguished by its focus on improving the lot of humankind and, in some instances, the dignity of life itself.

The Laureates for these awards include scientists and practitioners in a wide range of fields. They represent a special kind of innovation and entrepreneurial endeavor. They are all concerned about technology *in use*, and they envision a world in which the fundamental purpose of science and technology is to serve humanity. Some might be described as *social benefit entrepreneurs*. Their work has a “double bottom line”—a conventional one that seeks sustainable economic viability and success, and a *social benefit* bottom line. To paraphrase Dickens, mankind is the business of these social benefit innovators and entrepreneurs.

In addition to recognizing and celebrating these innovators, there is a great deal to be learned from their breakthrough thinking in adapting science and technology for the greater good. They are footsteps in a worthy journey. They bring fresh insights to the urgent concerns of humanity (see *Some Lessons Learned From First Year Winners* below). Their work is recognized for both its demonstrated impacts and its future promise. Because of the potential for replication or scalability, a Tech Laureates Venture Network program is being initiated this year to foster continued support for promising innovations.

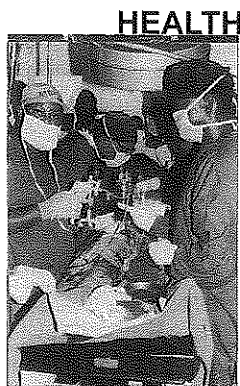
EDUCATION



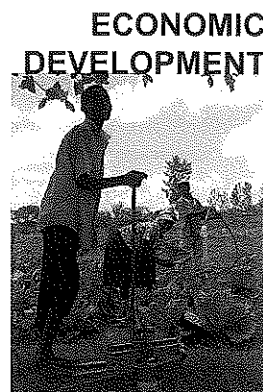
EQUALITY



ENVIRONMENT



HEALTH



ECONOMIC DEVELOPMENT

Launch of a New Global Initiative: An Overview of The Tech Laureates Venture Network

Howard Neff



"The Tech Awards and its various programs are meant to recognize and inspire the many 'unsung heroes' throughout the world that the market may have overlooked, but are successfully applying technology to benefit humanity."

James C. Morgan,
Chairman and Chief Executive Officer,
Applied Materials, Inc.

To a large extent, the Tech Laureates concept evolved out of observing the communications amongst the Awards' 25 first year Laureates. In the days prior to, during, and since the Awards, Laureates have been eager to exchange experiences, and to glean knowledge and support from others whose work was driven by common values. Several shared the desire to leverage early success through replication or to learn from others that had succeeded in developing viable models for sustainability. For some, the challenges of scalability or developing a "business model" to support future growth seemed similar to the challenges that are common to Silicon Valley start-ups.

The Tech Laureates Venture Network is being initiated this year with the vision and sponsorship of Applied Materials and with the full support of The Tech Museum. This new network will convene the day after the Tech Museum Awards gala and will be made up of the 2002 Tech Awards Laureates who will meet face-to-face with other globally minded individuals, philanthropists, business and nonprofit leaders. The Network seeks to support the formation of a learning community amongst Laureates and to link honorees to the know-how, financial, and other resources that might support the wider scale replication and growth of their work. Hopefully, the promise of a "double bottom line," of economic success and social benefit outcomes, will enable the work of a Tech Museum Laureate to attract support where it is needed to enable a wider future impact.

More information, including the names of the 2002 Tech Laureates, may be found on the newly launched *Tech Laureates Venture Network* website (<http://www.techawards.thetech.org/>).

Millennium Summit Development Goals

At the Millennium Summit in September 2000—the largest ever gathering of world leaders eight over arching goals were adopted to direct the

humanitarian efforts of the United Nations through the year 2015. As Table 1 indicates, categories for the Tech Museum Awards are closely aligned with the Millennium Summit Development Goals.

| Table 1 Millennium Summit Development Goals and Tech Museum Awards | |
|---|----------------------|
| Millennium Goals | Awards Category |
| <i>Income Poverty:</i> To decrease by 50 percent the proportion of people in extreme poverty by 2015. (Measures: Percent of population below national poverty line; percent of population below US \$1 a day.) | Economic Development |
| <i>Food Security and Nutrition:</i> To decrease by 50 percent the proportion of people who suffer from hunger by 2015. (Measures: Percent of population below minimum level of dietary energy consumption [malnutrition]; percent of underweight under age 5.) <i>Health and Mortality:</i> To reduce the spread of HIV/Aids by 2015; to reduce the under 5 mortality rate by two-thirds by 2015. <i>Reproductive Health:</i> To reduce the maternal mortality rate by three-quarters by 2015; to achieve universal access to safe, reliable contraceptive methods by 2015. <i>Housing and Basic Household Amenities and Facilities:</i> To decrease by 50 percent the proportion of people unable to reach or afford safe drinking water by 2015. | Health |
| <i>Education:</i> To achieve universal access and completion of primary education by 2015. | Education |
| <i>Gender Equality and Women's Empowerment:</i> To eliminate gender disparity in primary and secondary education by 2005. | Equality |
| <i>Environment:</i> All countries to be implementing a current national strategy for sustainable development by 2005. | Environment |

The five recognition categories for the Tech Museum Awards grew out of The Millennium Project⁵ and its nodes of expert participants in both the developed and developing worlds. This project raised practical "how" questions regarding global challenges such as those highlighted in Table 1. As the examples below indicate, science and technology are potential points of leverage for several of these challenging questions.

- How can everyone have sufficient safe water without conflict?
- How can population growth and resources be brought into balance?

- How can the threat of new and re-emerging diseases and immune microorganisms be reduced?
- How can growing energy demand be met safely and efficiently?
- How can sustainable development be achieved for all?
- How can globalization and the convergence of information technology and communications work for everyone?
- How can scientific and technological breakthroughs be accelerated to improve the human condition?

The imaginative use of extant technologies, political will, and the commitment of individuals, governments, businesses, and civil society will be vital in marshalling local and global capacities to address questions such as these. In addition, longer-term solutions may necessitate the greater channeling of future scientific and technological research in the direction of these vital concerns.



Some Lessons Learned From First Year Winners

A preliminary review of the 25 Tech Museum Award Laureates in 2001 (then called "Finalists"), five for each of the five award categories, provides intriguing clues on how science and technology might play a significantly greater future role in enhancing the quality of life for all. While the Santa Clara University Center for Science, Technology, and Society intends to deepen this analysis, some highlights from the inaugural year suggest fruitful avenues for future research and some important guideposts for practice. In particular, the first year's Laureates highlight the failure of normal market mechanisms to successfully bridge the potential of technology to meet the urgent needs of humanity. They illustrate the important roles of NGOs (Non-Government Organization), government-sponsored research, and philanthropic organizations. They also underscore the insight that can come from adopting alternative world views in rethinking the design of technology, the critical roles of social benefit entrepreneurs, and the need for local capacity building in making technology affordable and useful for those previously excluded from access.

Market Failure

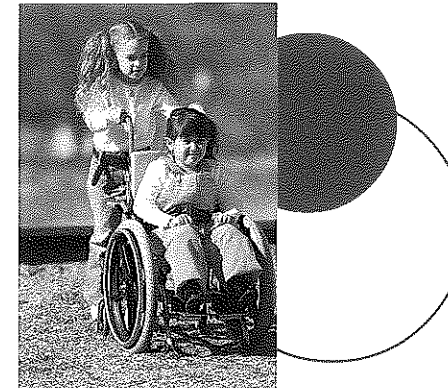
Markets drive expensive science and they also shape the kinds of technology that are developed and commercialized. The Tech Museum Awards recipients followed non-conventional paths. In many instances, they have made up for market failure.

Education: In Africa, the Freeplay Foundation overcame the constraints of extreme poverty, illiteracy, and the lack of electricity through a creative adaptation of the self-powered radio technology of its parent company, the Freeplay Energy Group. It coupled rugged, simple to use wind-up radios with relevant content in local dialects on AIDS/HIV, agriculture, current events, and education.

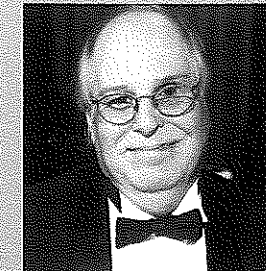
Economic Development: In Brazil, Fabio Luis de Oliveira Rosa and his colleagues at the Institute for Development of Natural Energy and Sustainability developed breakthrough technologies for generating and distributing electricity to low-density rural areas where poverty and the economics of normal market supply channels precluded electrification. In a nation where 25 million people have no access to electricity, the conventional wisdom was that poverty, environmental degradation, and brutally harsh living conditions were simply an inevitability of daily life. Access to low cost electricity is key to changing this assumption and the economic viability of rural areas.

Environment: At the Audubon Center for Research on Endangered Species, Betsy Dresser and her colleagues overcame an important obstacle to repopulating endangered species through the application of Assisted Reproduction Technology. Prior work has focused on restoring habitats, but Dresser is attacking the problem of species extinction by applying advanced technology to preserve diverse gene pools and reduce reproductive stress through embryo transfer using in vitro fertilization and maturation. Reducing threats to species extinction is a public good. It is not an area in which private, commercial market mechanisms work. Fortunately, the Audubon Center for Research, with its public and philanthropic support, exists to partially fill the void left by this instance of market failure.

Health: The search for a cure for malaria is another example of market failure. Although this disease is a serious public health threat for 2.4 billion people in 90 countries, these are poor countries, and there has been little market incentive to encourage expensive scientific research to find a cure. In a world in which science follows markets, Professor Joseph DeRisi at University of California, San Francisco is a social benefit scientist and entrepreneur. He is applying DNA micro-array technology to study thousands of genes simultaneously and disseminating information via the web to greatly reduce the cost and speed the search for new drug therapies for this global health problem. Here again, public and foundation funding is filling the void of market failure—in this instance where those in need of treatment have few if any "economic votes."



Equality: For amputees, access to prosthetics is limited to those who can afford high cost custom socket designed limbs and regular access to primary health services to inspect for possible infection. For the 25 million people who do not have access to expensive prosthetic limbs, Chaz Holder of CZBioMed developed the Socketless Prosthetic Technology. These inexpensive, durable, high-quality limbs eliminate the need for customized sockets and require minimal medical follow-up. Because of this they are deployable in poor nations like Sierra Leone, Vietnam, and Afghanistan, where hundreds have been fitted. They are improving the mobility and quality of life for men, women, and children with meager means. In this instance the dominant technology and economic considerations had previously excluded a large segment of humanity from this "market." Chaz Holder redefined the market, and made the circle bigger and more inclusive when it came to access to the benefits of technology.



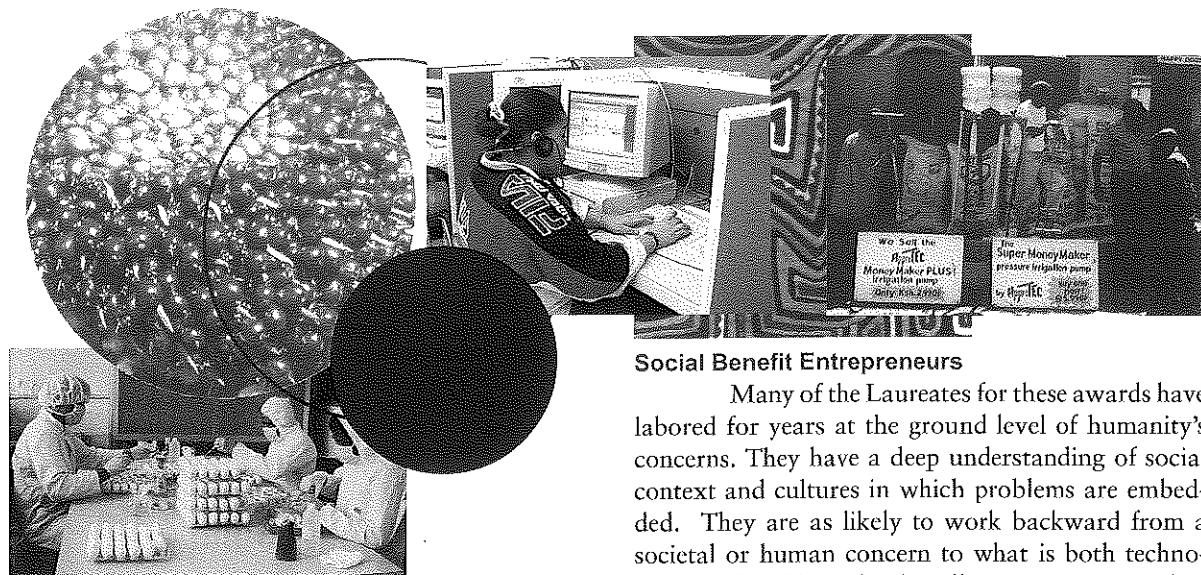
In Memoriam Chaz M. Holder

The inaugural recipient of the Knight Ridder Equality Award was Chaz Holder whose company, CZBioMed Enterprises, makes prosthetic limbs that are low in cost and immediately adaptable by the user. Chaz passed away on July 4, having enriched the lives of numerous people in both developing and developed countries by creating opportunities for them to purchase affordable, user compatible prosthetics and live a more productive life.

Earlier this year Chaz wrote to the Center for Science, Technology, and Society (CSTS) and expressed what being a Laureate in and recipient of the Tech Museum Awards meant to him. "The event, without question, was the most wonderful evening of my life . . . All of the Laureates were amazing individuals focused on doing incredible work, and just the opportunity to meet them, all of the Award Sponsors, all of the folks at The Tech Museum, and all of you who made it happen was a chance of a lifetime experience."

The funds Chaz was given as an award recipient were used to further his work. In part because of publicity received from the Awards he and his partner, Ruth Clark, were moving forward with projects with the Department of Defense to help protect de-mining personnel from injury and with the Marshall Legacy Institute to develop and implement self-sustaining prosthetic manufacturing and fitting facilities.

On June 5, 2002, we at CSTS were privileged to have Chaz be the presenter at a symposium on his work. Along with SCU faculty and students, we were able to learn about and experience first hand the amazing technology behind the prosthetics produced by CZBioMed. Chaz truly exemplified the spirit of the Tech Museum Awards. He will continue to inspire our work.



New Organizational Forms

The 25 Laureates reflect a diversity of organizational actors and innovative organizational forms. Given the failure of conventional market-based models, especially in instances where underserved populations lack economic votes (e.g., African villagers) or services involve public goods (e.g., species survival, rural electrification in Brazil), it is not surprising that the private sector provided leadership for only 24 percent (6) of last year's Laureates. The source of creative imagination was much more likely to be found beyond the corporate sphere: in non-profit organizations (8 Laureates, 32 percent of the total); in hybrid organizations (7 Laureates, 28 percent of the total) that included public-private partnerships (2) and a new type of NGO that combined technological innovation with advocacy (5). In addition, university based labs were the organizational locus for four (sixteen percent) of last year's Laureates.

While it is beyond the scope of this article to provide a more refined analysis, the variety of organizational types represented amongst Laureates raises interesting questions about the kinds of settings in which technology is most likely to take root in benefiting previously unmet needs. In this regard, hybrid structures—public-private partnerships and NGOs that embrace technological innovation as a focal strategy—may be especially promising areas for exploration. In addition, universities are likely to play an increasingly important role in diffusing basic and applied research, in challenging assumptions about technology design, and in developing more imaginative business models for better serving the needs of all of humanity.⁶ Public-private partnerships may also be key to mobilizing global science and technology to address the economic development needs of poor nations, environmental degradation, illiteracy, demographic stress, and betterment in the lives of those who suffer from human disease, inequality, and poverty. In addition, the important role of “social benefit entrepreneurs” cannot be overstated.

Social Benefit Entrepreneurs

Many of the Laureates for these awards have labored for years at the ground level of humanity's concerns. They have a deep understanding of social context and cultures in which problems are embedded. They are as likely to work backward from a societal or human concern to what is both technologically feasible and culturally appropriate, as they are to be guided by the frontiers of science. Much like corporations have specialists for penetrating vertical markets, Tech Award Laureates often have *domain expertise* that grows out of combining an appreciation of the social and cultural context of the problems with real genius in developing and applying solutions from a range of scientific, technological, and design possibilities. In the future we should seek better ways of incubating and supporting the efforts of these “social benefit entrepreneurs.”

Local Capacity Building

Technological imagination characterized all of the 2001 Laureates, but beyond their capacity for invention they were systems thinkers and local capacity builders. A “systems approach” is needed for the benefits of modern science and technology to have a sustainable impact on complex human and ecological needs. For technology to achieve its potential around the world, local needs, cultures, identities, and language must be respected. In addition, deploying technological tools may entail overcoming the formidable challenges of limited infrastructures, illiteracy, and extreme poverty. Great chasms may have to be crossed and reliable results are far from assured. Technological and social innovation must evolve hand in hand if sustainable progress is to be realized. This happens in local places—in the schools, hospitals, neighborhoods, and cities where people gather, new tools are applied, and sense making occurs. It is important to establish beachheads for technological innovation and social/institutional learning and adaptation in local places, including those that exist in the developing world. The Laureates from last year's awards program have been conscious of the need to create a development dynamic that complements scientific and technological innovations with social learning and institutional change. In this way, local practice can, in an iterative manner, shape future innovations through a process that John Seely Brown refers to as “enacting the future.”⁷

<http://sts.scu.edu/nexus>

Conclusion

Both inspiration and learning can be derived from the 2001 Tech Award Laureates. They are scientists, innovators and entrepreneurs whose contributions benefit the common good in a significant way. They bring science to bear on problems where markets have failed. They build capacity for the betterment of human life in local places. Their creative imaginations respect local needs and often overcome onerous practical constraints. They may, in fact, possess the domain expertise that has been missing in efforts to diffuse the benefits of modern science and technology beyond the top of the pyramid to all of humanity. As evidenced in the articles that follow, this year's Laureates continue the inspiration provided in the inaugural year of the Awards.

End Notes

¹ AnnaLee Saxenian. “Networks of Immigrant Entrepreneurs,” *The Silicon Valley Edge*, Chong-Moon Lee, William Miller, Marguerite Hancock, Henry Rowen, eds., (Stanford California: Stanford University Press, 2000), 248-268.

² Proceedings, First Glocalization Conference, May 11-13, 2002, Rome, Italy. See www.glocalforum.org.

³ Joseph Stiglitz, *Globalization and Its Discontents*, W.W. Norton and Company, New York, 2002.

⁴ Thomas L. Friedman, *The Lexus and the Olive Tree*, Farrar, Strauss and Giroux, New York, 2000.

⁵ Jerome C. Glenn and Theodore J. Gordon, *2001 State of the Future*, American Council for the United Nations University, The Millennium Project, 2001.

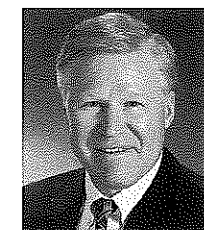
⁶ C.K. Prahalad and Stuart L. Hart. “The Fortune at the Bottom of the Pyramid,” *Strategy + Business*, First Quarter 2002. <<http://www.strategy-business.com/search/archives/?issue+226981>>

⁷ John Seely Brown. “Changing the Game of Corporate Research: Learning to Thrive in the Fog of Reality,” *Technological Innovation—Oversights and Foresights*. Raghu Garud, Praveen Rattan Nayyar, Zur Baruch Shapira, eds, (Cambridge, N.Y. Cambridge University Press, 1997), 95-110.

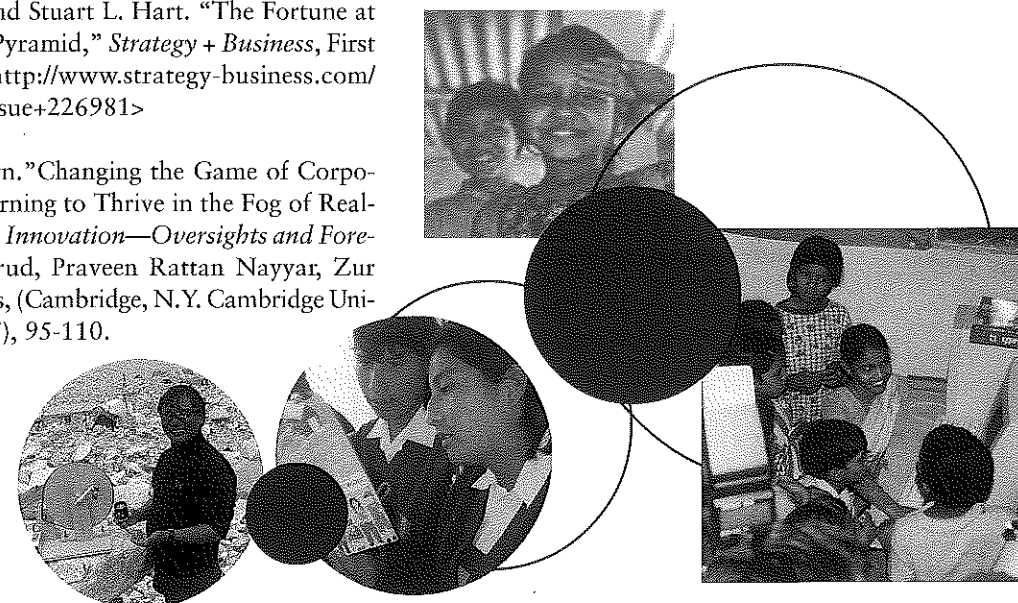
About the Authors



James L. Koch is Director of the Center for Science, Technology, and Society, and Professor of Management at Santa Clara University. He received his MBA and Ph.D. from UCLA. From 1990-96 he served as Dean of the Leavey School of Business and Administration. Prior to that he founded and directed the Organization Planning and Development Department at PG&E (1981-1990). He began his university career at the University of Oregon, where he also directed the MBA and Ph.D. programs. His research and consulting have focused on socio-technical systems and high performance organizations. His current work examines information technology and organizational change, social capital and community in the workplace, and the deployability of technology in the developing world.



Howard Neff joined Applied Materials in 1980, where he has held many operations and executive management positions. His most recent assignment was as President of Etec Systems, Inc., an Applied Materials company. Before coming to Applied Materials, Mr. Neff worked for 12 years at Johnson and Johnson in various manufacturing and management roles, including a two-year assignment in Europe. He received his B.A. in economics from Dartmouth College in Hanover, NH. Howard is also a Board Member of Invisible Ink, Inc., a member of the Board of Advisors for Duration Software, Inc., a Senior Fellow of the American Leadership Forum-Silicon Valley, and an Honorary Board Member for the non-profit PCA-CA, Prevention of Child Abuse-California.





Technology Benefiting Humanity

LAUREATES OF THE TECH MUSEUM AWARDS

Presented by Applied Materials, Inc.

EDUCATION
EQUALITY
ENVIRONMENT
HEALTH
ECONOMIC DEVELOPMENT



Fall 2002 • Volume 3 • Number 1

STS NEXUS



Santa Clara University

CENTER FOR SCIENCE, TECHNOLOGY, AND SOCIETY