

---

# Konarka



Dr. Jack M. Wilson

Distinguished Professor of Higher Education, Emerging Technologies, and Innovation



Konarka Technologies president and CEO William M. Bechenbaugh holds a roll of the company's light-weight, flexible solar cell material that may make the power source more affordable and more widely available than its hard-cell counterpart.

# Sukant Tripathy

---

Sukant Tripathy, Professor at the University of Massachusetts Lowell founded Konarka in 2001 along with other cofounders mentioned below.

Konarka was developing flexible solar cells to be integrated into building designs and even fabrics.

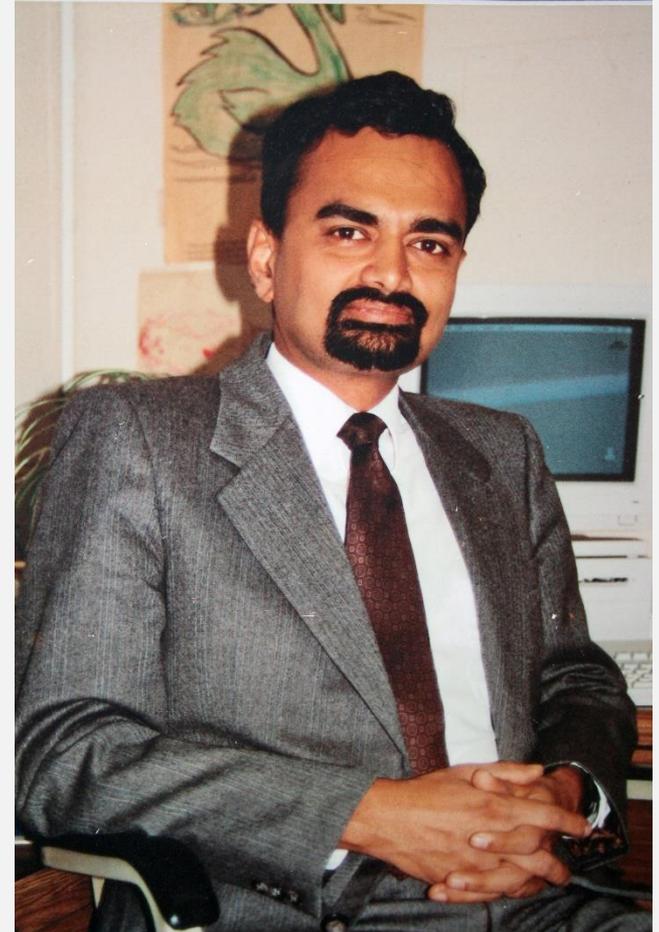
Sukant was born in Bihar, India, and he did his undergraduate work at the Indian Institute of Technology at Kharagpur. He received his Ph.D. in polymer science from Case Western Reserve University in 1981, and then joined GTE Laboratories. At GTE Labs, he became manager of the organic and polymer science department.

In 1985, he joined the chemistry faculty at the University of Massachusetts Lowell. He founded and served as director of the Center for Advanced Materials from 1992. He also served the University as provost and vice chancellor for academic affairs from 1994 to 1996.

Sukant Tripathy was recognized around the world for his research in thin polymer films and their electrical and linear and nonlinear optical properties. In 1993, he was awarded the Carl S. Marvel Creative Polymer Chemistry Award of the American Chemical Society Division of Polymer Chemistry. He had published more than 200 papers in the areas of interest and held two dozen patents.

He died on December 12, 2000 in a swimming accident in Hawaii after lecturing at a conference of the Polymer Chemistry Division of the American Chemical Society

- [-https://www.uml.edu/research/cam/tripathy-memorial/](https://www.uml.edu/research/cam/tripathy-memorial/)



# Konarka

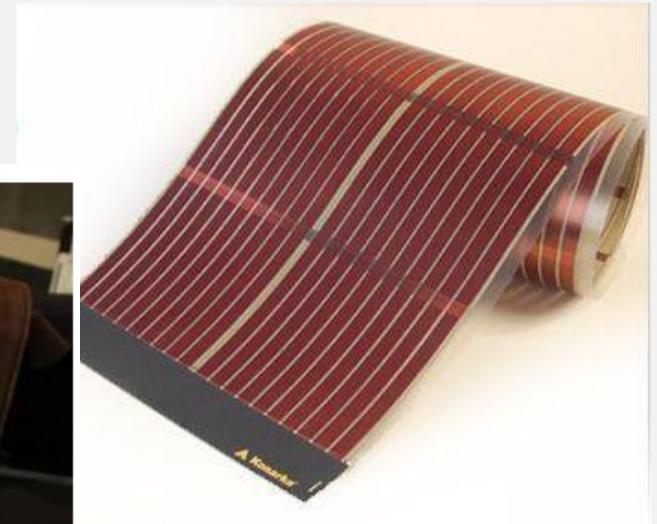
---

- Sukant Tripathy's research led to patents for creating flexible solar cell technologies that quickly attracted attention from academe, industry, and the military.
- He founded Konarka, along with Howard Berke, Russell Gaudiana, and Alan Heeger, a Nobel Prize winner and friend and colleague of Sukant. He also included four of his colleagues, Jayant Kumar, S. Balasubramanian, K. Chittibabu, and L Li. The last three are former doctoral students of Tripathy and Kumar.
- The name of the company was suggested by Tripathy's wife, Susan, who suggested the name, Konarka (or Konark), after a temple in Orissa, India, dedicated to the Hindu sun god Surya. This was a temple in Tripathy's hometown which he would often visit..

# Konarka: flexible solar cells

---

- Konarka created flexible solar cells that could be incorporated into clothing, baggage, tents, rooftops and other flexible areas.



Konarka's flexible solar cells are well suited for charging portable electronics or building-integrated photovoltaics

Martin LaMonica/CNET

# It began with a partnership between UML and Natick Labs

---

- Description from IEEE in 2004:
- *On a Roll: Konarka has found a way to put Grätzel cells on a cheap, light, flexible plastic that can be printed roll-to-roll.*
- *The military's push into organic PV began four years ago at the Natick center, which is to the U.S. foot soldier what Q is to James Bond at MI6.*
- *In 2000, Natick teamed up with chemists at the University of Massachusetts Lowell, who were working on Grätzel cells, a form of organic PV named for Michael Grätzel of the Swiss Federal Institute of Technology in Lausanne. (Grätzel invented the cells 12 years ago;*
- *The team at Lowell had been assembled by the late Sukant K. Tripathy, a talented chemist who developed a process for attaching particles of titania--titanium dioxide--to plastic.) Grätzel cells mimic photosynthesis: light-sensitive organic dyes dissolved in an electrolyte absorb light and transfer energized electrons to titania nanocrystals sintered to an electrode-coated substrate.*
  - <https://spectrum.ieee.org/energy/renewables/can-organics-replace-silicon-in-pv>

## IEEE article continued,,

---

- *By 1994, the best Grätzel cells generated power at 10 percent efficiency--rivaling the best commercial solar panels of the time--yet the technology languished because the liquid electrolytes were sensitive to heat and prone to leakage. For Samuelson and her colleagues at Natick, Grätzel cells had a final, fatal flaw: assembled on glass plates that could withstand the titania-sintering step at 450 °C, they were hardly appropriate for a backpack.*
- *But over the last four years, the University of Massachusetts team, since spun off in Lowell as Konarka Technologies Inc., has addressed each flaw, and this winter it hopes to complete its first military prototypes. Konarka plans to begin selling modules by mid-2005, and with US \$13.5 million in venture capital and such business partners as Eastman Chemical Co. in Kingsport, Tenn., and utility giant Electricité de France, they appear to have the resources to get there.*
- *Konarka worked with Grätzel to develop heat-stable gel-based electrolytes, whose viscosity makes them more leakproof than liquids, and a tighter sealing material to keep the electrolyte fixed. "You can take these cells and cut them in half, and they still work," Samuelson says.*
- *Most important, Konarka found a way to produce the cells on cheap, light, and flexible sheets of poly-ethylene terephthalate (the clear plastic of soda bottle fame) in a continuous process. Titania particles 20-30 nm in diameter are sintered onto stainless steel or titanium foil in 1- to 2-cm-wide strips, which are then laminated onto the plastic sheet, covered with electrolyte, and capped with an electrode-coated top sheet of plastic.*
  - <https://spectrum.ieee.org/energy/renewables/can-organics-replace-silicon-in-pv>

# The technology

---

- *Konarka planned to develop and commercialize its polymer-based organic photovoltaic (OPV) technologies.*
- *Konarka's advanced photovoltaic technology started with the work of the late Dr. Sukant Tripathy, an internationally known polymer materials scientist, provost at UMASS Lowell and founder of the Plastic Innovation Center and Dr. Alan Heeger, Konarka's chief scientist, who was awarded the Nobel Prize in chemistry in 2000.*
- *The ground-breaking discoveries from both founding scientists led to Konarka's underlying technology leadership, including a manufacturing process at relatively low temperatures, which enables the use of low-cost plastic substrate films.*
- *As a result of these pioneering innovations, the company has secured over \$100 million from leading venture capital and private equity funds, as well as \$18 million in government agency research grants from the U.S. and Europe.*
  - <http://www.businesswire.com/news/home/20081007005342/en/Konarka-Opens-Worlds-Largest-Roll-to-Roll-Thin-Film#.VELYkqTwthE>

# Funding

---

- As of 2006, Konarka had received \$60 million in funding from venture capital firms including
  - 3i, Draper Fisher Jurvetson, New Enterprise Associates, Good Energies and Chevron Technology Ventures.[3]
- Konarka also received nearly \$10 million in combined grants from the Pentagon and European governments,
- In 2007 it was approved for further funding through the Solar America Initiative, a component of the White House's Advanced Energy Initiative. The company raised a further \$45 million in private capital financing in October 2007 in a financing round led by Mackenzie Financial Corporation.
- The company also received \$1.5 million from a state of Massachusetts alternative energy trust fund in 2003 during Governor Mitt Romney's term and another \$5 million during Governor Deval Patrick's term.
- At the time of its bankruptcy filing in 2012, its funding history was summarized: "Konarka raised more than \$170 million in private capital investments and \$20 million in government grants, according to its website.
- Under the Bush administration, Konarka received a \$1.6 million Army contract in 2005 and a \$3.6 million award from the Department of Energy in 2007.
- Under the Obama administration, Konarka was one of 183 clean-energy companies that got a total of \$2.3 billion in tax credits as part of the 2009 stimulus.
  - [https://en.wikipedia.org/wiki/Konarka\\_Technologies](https://en.wikipedia.org/wiki/Konarka_Technologies)
- In 2010, the company raised \$20 million from Konica Minolta, which wanted build a manufacturing joint venture in Japan. Konarka had lined up many other investors, too, including Draper Fisher Jurvetson, Good Energies, 3i, Mackenzie Financial Corp., Pegasus Capital, Asenqua Ventures, New Enterprise Associates , Vanguard Ventures, Chevron Ventures, Massachusetts Green Energy Fund, NGEN Partners, Angeleno Group and Total, the French oil and gas giant who invested \$45 million in 2008. - <https://gigaom.com/2012/06/01/solar-thin-film-maker-konarka-files-for-bankruptcy/>

# Buying a closed Polaroid Manufacturing Facility

---

- Moving forward they bought a closed Polaroid Manufacturing Facility
- *Constructed and further expanded in the 1990's for Polaroid's advanced technology development and large-scale manufacturing, Konarka's New Bedford facility has been retrofitted to immediately begin initial production of Power Plastic. Using multiple in-line processing stations with precision multi-layer manufacturing processes that are adaptable to a variety of printing and coating technologies, the facility will enable the company to further develop and advance nano-enabled polymer photovoltaic materials that are lightweight, flexible and more versatile than traditional solar materials.*
  - <http://www.businesswire.com/news/home/20081007005342/en/Konarka-Opens-Worlds-Largest-Roll-to-Roll-Thin-Film#.VELYkqTwthE>

# Problems?

---

- *But will low-cost organic PV ever crack the most price-sensitive market of all: rooftop panels? Today's rooftop installations are warranted to operate through 20-30 years of environmental abuse, and that's a high bar for organic electronics, which tend to be less stable than inorganic semiconductors. Several decades of warranted performance is a "tremendous requirement," says Franz Karg, global head of R and D for PV producer Shell Solar, an Amsterdam subsidiary of the Royal Dutch/Shell Group in The Hague. "Frankly, I don't expect this performance in the next 10 to 15 years from organics, if it's possible at all." Nanosys and Matsushita insist they can deliver that performance by 2007.*
  - <https://spectrum.ieee.org/energy/renewables/can-organics-replace-silicon-in-pv>
- *Thin-film organic photovoltaic cells are cheaper than other solar cell technologies because of the material that's used. But the efficiency has limited their potential applications to areas such as embedded solar cells in buildings or portable solar chargers for electronic gadgets*
  - <https://www.cnet.com/news/konarka-touts-gains-on-niche-y-flexible-solar-cells/>
- *Not surprisingly, Konarka's product could not compete. Its thin-film solar panels – called Power Plastic – were designed to charge electronic devices by sticking to the fabric of a messenger bag or a soldier's tent. The Globe reported in 2010 that Power Plastic's short life spans – at most five years – and its inefficient conversion of light into electricity — 3% to 4% — compared to traditional solar panels – 15% to 20% – made the product a tough sell.*
  - <http://www.forbes.com/sites/petercohan/2012/06/05/konarka-mitts-bankrupt-solar-bet/>

## Due diligence? (From Forbes Article in 2012)

---

- *“So I am surprised that Romney was willing to lend state money to Konarka. Moreover, given his reputation for analytical savvy, I would have expected him to see what a lousy investment solar cells are.”*
- *“This is clear from doing a very basic job of industry analysis – something that Romney could not have escaped learning as a consultant and private equity firm runner. Industry analysis – detailing the forces that determine a market’s profit potential — was made more sophisticated by Harvard Business School professor, Michael E. Porter, with whom I worked.”*
- *“That analysis could have been done because all the factors were public knowledge in 2000 – three years before Romney backed Konarka. As I wrote last August, the basic lesson is that fast growth in an industry does not equate to high profitability. In 2000, the solar industry accounted for 175 megawatts worth of energy represented by the solar panels it produced. By 2010, the industry had grown to 16,000 megawatts at a compound annual growth rate of 57%.”*
- *“But this rapid growth attracted competitors from China who were able to manufacture solar cells with far lower labor costs and they cut prices to gain market share.”*
  - <http://www.forbes.com/sites/petercohan/2012/06/05/konarka-mitts-bankrupt-solar-bet/>

# The end: June 01, 2012 05:10 PM Eastern Daylight Time

---

- “LOWELL, Mass.--(BUSINESS WIRE)--Konarka Technologies, Inc., a leading developer of thin-film solar panels, has filed for bankruptcy protection under chapter 7 of the Federal bankruptcy laws. Under chapter 7 proceedings, the company’s operations cease and a trustee is tasked with liquidating the company’s assets for the benefit of creditors. Creditors will be asked to submit their claims to the Bankruptcy Court and are unable to obtain payment from the company.”
- “Howard Berke, chairman, president and CEO of Konarka, said, “Konarka has been unable to obtain additional financing, and given its current financial condition, it is unable to continue operations. This is a tragedy for Konarka’s shareholders and employees and for the development of alternative energy in the United States.” “
- “Konarka was founded by Mr. Berke and by Dr. Alan Heeger, the winner of the Nobel Prize for his work in conductive polymers. Among the Company’s assets are over hundreds of owned and licensed patents and patent applications in the field of solar energy and a state-of-the-art manufacturing plant in New Bedford, Massachusetts. “
- “Mr. Berke noted that several large international companies had expressed interest in financing or acquiring the company. He further noted that, given the worldwide interest in the company, including from the Chinese government, the company had not entirely given up hope that a rescue financing or acquisition would emerge in the bankruptcy. Under Chapter 7 proceedings, however, any such transactions are evaluated by a trustee and not by the company itself. “
  - <https://www.businesswire.com/news/home/20120601006015/en/Konarka-Technologies-Files-Chapter-7-Bankruptcy-Protection>

# The sad ending.

---

- *The news of Konarka's descent into Chapter 7 bankruptcy (announced via Businesswire in classic bury-the-story fashion, late last Friday afternoon, June 1) drew the attention—and ire—of many media and analyst observers. Recommended reading includes Lux Research's concise, to-the-point commentary about the organic photovoltaics developer makes it clear that the company's failure (and failure it is—this ain't no Chapter 11 with hope of corporate redemption) had nothing to do with the current difficult market conditions and everything to do with the particularities of the company's technology and business plan. "Finding market success in emerging technologies takes many factors, but a viable technology underpins all of them, something that Konarka never had and no credible path to attain," says one particularly cogent excerpt.*
  - <http://www.solarcurator.com/2012/06/08/konarka-snark-meets-pv-pipeline-exuberance/>

# Questions

---

- What would you suggest would be the main reason that Konarka failed?
- Konarka had success in raising significant funding for their business. Why do you think investors were so enthusiastic about Konarka?
- Some commentators have suggested that investors failed to do their due diligence on the investments they made in Konarka. Do you feel that this is an accurate charge?
- How much do you think timing had to do with the failure. Were they too early to market with an immature technology?