# GEN-2 ERC SYSTEMS VISIONS

The system visions of 28 Gen-2 ERCs are summarized below.

The six ERCs awarded in 1994 and 1995, at the start of Gen-2, had the following systems visions:

* **Institute for Systems Research** **(ISR),** University of Maryland and Harvard University – Methodologies and tools for addressing systems problems in a variety of application domains.[[1]](#footnote-1)[[2]](#footnote-2)
* **Biotechnology Process Engineering Center (BPEC)**,MIT –Explore and develop therapeutic protein and gene biotechnology delivery systems.[[3]](#footnote-3)[[4]](#footnote-4)
* **Center for Collaborative Manufacturing** **Systems**, Purdue University – Investigate fundamental engineering principles that are critical to the success of collaborative manufacturing or test the limits of the concept in case of the most demanding requirements. [[5]](#footnote-5)[[6]](#footnote-6)
* **Center for Neuromorphic Systems Engineering (CNSE)**, California Institute of Technology – Develop the technology infrastructure for endowing the machines of the next century with the senses of vision, touch, and olfaction, which mimic or improve upon human sensory systems.[[7]](#footnote-7)
* **ERC for Particle Science and Technology** **(PERC),** University of Florida at Gainesville – Create underlying scientific knowledge and invent and demonstrate the technological feasibility of innovative methodologies and systems governing particulate processes, devices, and systems.[[8]](#footnote-8)
* **Packaging Research Center (PRC)**, Georgia Institute of Technology – Develop and prototype low-cost, high-performance, and portable electronic packages consistent with industry needs to improve performance of electronic products significantly while simultaneously reducing size and cost.[[9]](#footnote-9)

The four ERCs awarded in 1996 had the following systems visions:

* **ERC for Environmentally Benign Semiconductor Manufacturing (CEBSM),** University of Arizona with Arizona State University, the University of California at Berkeley, Cornell University, MIT, and Stanford University – Develop processing systems to reduce water, chemical and energy usage, and waste and hazardous chemicals discharges through source reduction, process alternatives/modifications, and emission abatement.[[10]](#footnote-10),[[11]](#footnote-11)
* **Center for Innovative Product Development** **(CIPD),** MIT – Develop methods, procedures, and software tools to improve the product development processes and systems.[[12]](#footnote-12)
* **Integrated Media Systems Center (IMSC),** University of Southern California – Electronic systems to enable a move from the two-dimensional world of computers, television, and film to 3D and 4D immersive environments with visual, aural, and tactile capabilities.[[13]](#footnote-13)
* **Engineered Biomaterials Engineering Research Center (UWEB)**, University of Washington – Revolutionize the system interface between an implant and other biomedical devices with bodily tissue.
* **Center for Reconfigurable Machining Systems (RMS)**,University of Michigan with Michigan Technological University – Develop reconfigurable machining systems for flexible manufacturing based on modularity, customization, convertibility, integration, and diagnosability. [[14]](#footnote-14)

In 1997, the Earthquake Hazards Mitigation Program in the Division of Civil and Mechanical Systems funded three centers outside of the ERC Program. In 1999, their cooperative agreements and budgets were transferred to the ERC Program for more effective funding and oversight. Their visions were:[[15]](#footnote-15)

* **Pacific Earthquake Engineering Research Center (PEER),** University of California at Berkeley, with California Institute of Technology, Stanford University, University of California at Davis, University of California at Irvine, University of California at Los Angeles, University of California at San Diego, the University of Southern California, the University of Washington, and nine affiliate institutions - Develop urban earthquake risk reduction technologies within a performance-based earthquake engineering framework.[[16]](#footnote-16)
* **Mid-America Earthquake (MAE) Center**,University of Illinois at Urbana-Champaign, with Georgia Institute of Technology, the University of Memphis, MIT, St. Louis University, Texas A&M University, and Washington University – Reduce potential earthquake losses in the central and eastern United States by concentrating on problems associated with low-frequency seismic events and the consequences these have for the people, economy, and civil infrastructure.[[17]](#footnote-17)
* **Multidisciplinary Center for Earthquake Engineering Research (MCEER)**, University at Buffalo with Cornell University, University of Delaware, University of Nevada at Reno, and University of Southern – Develop and advance emerging technologies for design, construction, and intelligent engineering renewal of buildings and civil infrastructure in reducing earthquake losses.[[18]](#footnote-18)

The five ERCs in the Class of 1998 had the following systems visions.

* **Center for Advanced Engineering of Fibers and Films (CAEFF)**, Clemson University with MIT – Provide an integrated environment for the system-oriented study of next generation fibers and film, emphasizing the use of computation/visualization tools to overcome the barriers of experimental development, structure/property relationships, and control of structures.[[19]](#footnote-19)
* **Georgia Tech/Emory Center for the Engineering of Living Tissues (GTEC),** Georgia Institute of Technology and Emory University – Design and development of tissue substitutes that replace, enhance, or maintain natural tissue function.[[20]](#footnote-20)
* **Computer-Integrated Surgical Systems and Technologies ERC (CISST),** Johns Hopkins University with Carnegie Mellon University, MIT, Brigham Women’s Hospital and Shady Side Hospital – Advance knowledge and technology needed to develop a new generation of minimally invasive surgical techniques, tools, and systems.[[21]](#footnote-21)
* **Marine Bioproducts ERC,**University of Hawaii at Manoa with the University of California at Berkeley – Build processing systems for marine microorganisms to support an emerging marine biotechnology business sector devoted to high-value products destined for the chemical, pharmaceutical, nutraceutical, cosmetic, food, feed, and life sciences industries.[[22]](#footnote-22)
* **Center for Power Electronic Systems (CPES)**, Virginia Polytechnic Institute & State University, with North Carolina A&T State University, University of Puerto Rico at Mayaguez, Rensselaer Polytechnic Institute, and University of Wisconsin at Madison – Develop systems-level Integrated Power Electronics Modules (IPEMs), focusing upon the lower power range of power electronics (1kW-200kW) to yield more efficient and effective electronic power management systems.[[23]](#footnote-23)

In 1999 a special program solicitation was issued to determine if the ERC model could be effectively used to generate the development of curricula for the emerging field of bioengineering.

* **ERC for Bioengineering Educational Technologies** **(VANTH),** Vanderbilt University with Northwestern University, the Harvard University-MIT Division of Health Sciences and Technology, and the University of Texas at Austin; Class of 1999 – Develop next-generation educational technology for bioengineering education by integrating knowledge in bioengineering and other engineering fields, cognitive science, computer science/engineering, education, psychology, and the life and physical sciences.[[24]](#footnote-24)

The ERC Class of 2000 was comprised of two new ERCs with the following systems goals.

* **Center for Wireless Integrated MicroSystems (WIMS),** University of Michigan with Michigan State University and Michigan Technological University – Develop miniature low-cost integrated microsystems (a cochlear implant and an environmental pollution sensor) capable of measuring (or controlling) a variety of physical parameters, interpreting the data, and communicating with a host system over a bi-directional wireless link, addressing the intersection of microelectronics, wireless communications, and microelectromechanical systems (MEMS).[[25]](#footnote-25)
* **Center for Subsurface Sensing and Imaging Systems (CenSSIS),** Northeastern University with Boston University, Rensselaer Polytechnic Institute, University of Puerto Rico at Mayaguez, Brigham and Women’s Hospital, Lawrence Livermore National Laboratory, Massachusetts General Hospital, and Woods Hole Oceanographic Institution – Develop sensing and imaging technology involving detecting, locating, and identifying objects that are obscured beneath covering media—mapping plumes underground, detecting a tumor under the skin, and identifying developmental defects in the interior of an embryo by distinguishing the effect of a dispersive, diffusive, and absorptive medium from the desired details of the subsurface structure and functionality.[[26]](#footnote-26)

The four ERCs in the Class of 2003 had the following systems visions.

* **ERC for Extreme Ultraviolet Science and Technology** **(EUV ERC),** Colorado State University with the University of Colorado, Boulder and the University of California, Berkeley; Class of 2003 **–** Explore the development and application of compact coherent EUV sources.[[27]](#footnote-27)
* C**enter for Environmentally Beneficial Catalysis (CBEC),** University of Kansas, Lawrence with the University of Iowa and Washington University at St. Louis – Develop cost-competitive chemical manufacturing processes that prevent waste and conserve natural resources. [[28]](#footnote-28)
* **ERC for Collaborative Adaptive Sensing of the Atmosphere (CASA)**, the University of Massachusetts-Amherst in partnership with Colorado State University, the University of Oklahoma, and the University of Puerto Rico-Mayaguez – Revolutionize our ability to observe, understand, and predict hazardous weather by creating distributed collaborative adaptive sensing (DCAS) networks that sample the atmosphere where and when end-user needs are greatest.[[29]](#footnote-29)
* **Biomimetic MicroElectronic Systems (BMES) ERC*,*** University of Southern California in partnership with Caltech and the University of California, Santa Cruz – Develop transformative neural prostheses using novel biomimetic microelectronic systems based on fundamental principles of biology and engineering.[[30]](#footnote-30)

The five ERCs in the Class of 2006 had the following systems visions.

* **Quality of Life ERC (QoLT)**, Carnegie Mellon University in partnership with the University of Pittsburgh – Developintelligent systems and assistive technologies that augment body and mind to enable self-determination for older adults and people with disabilities.[[31]](#footnote-31)
* **Synthetic Biology ERC (SynBERC)**, University of California, Berkeley in partnership with Harvard University, the Massachusetts Institute of Technology, Prairie View A&M University (HBCU), and the University of California, San Francisco – Develop the understanding and technological tools needed to design biological systems for pharmaceuticals, renewable energy, and other areas where the high costs and long development times of conventional biological approaches are prohibitive.[[32]](#footnote-32)
* **ERC** **for Compact and Efficient Fluid Power (CCEFP),** University of Minnesota in partnership with Georgia Institute of Technology, Purdue University, the University of Illinois at Urbana-Champaign, and Vanderbilt University – Develop new compact and highly efficient fluid power systems that will enable energy savings in the agriculture, mining, health, construction, and transportation sectors.[[33]](#footnote-33)
* **ERC on Mid-Infrared Technologies for Health and the Environment (MIRTHE),** Princeton University in partnership with the City University of New York, Johns Hopkins, Rice University, Texas A & M University, and the University of Maryland–Baltimore County – Develop knowledge, technologies, and engineered systems based on mid-infrared (mid-IR) trace-gas spectroscopy that will provide unprecedented optical and chemical sensing capabilities for environmental monitoring, homeland security and medical diagnostics.[[34]](#footnote-34)
* **ERC for Structured Organic Particulate Systems, (C-SOPS)**, Rutgers University in partnership with New Jersey Institute of Technology, Purdue University, and the University of Puerto Rico-Mayaguez**;** Class of2006 – Design the future of pharmaceutical products and processes.[[35]](#footnote-35)
1. ISR at UMD. https://vimeo.com/isr/about [↑](#footnote-ref-1)
2. Class of 1985 ERC recompeted for full term of support but received a three-year term to test their ability to shift into the new vision. [↑](#footnote-ref-2)
3. Class of 1985 ERC successfully recompeted for a full term of support [↑](#footnote-ref-3)
4. http://grantome.com/grant/NSF/EEC-94?????? [↑](#footnote-ref-4)
5. Class of 1985 ERC successfully recompeted for a full term of support [↑](#footnote-ref-5)
6. http://grantome.com/grant/NSF/EEC-9402533 [↑](#footnote-ref-6)
7. http://grantome.com/grant/NSF/EEC-9402726 [↑](#footnote-ref-7)
8. http://perc.ufl.edu/mission.asp [↑](#footnote-ref-8)
9. http://grantome.com/grant/NSF/EEC9402723 [↑](#footnote-ref-9)
10. This ERC was jointly funded by NSF and the Semiconductor Research Corporation through a jointly developed and management program solicitation and review process. [↑](#footnote-ref-10)
11. http://grantome.com/grant/NSF/EEC9528813 [↑](#footnote-ref-11)
12. http://grantome.com/grant/NSF/EEC9529140 [↑](#footnote-ref-12)
13. University of Southern California Viterbi School of Engineering. (2008). *Integrated Media Systems Center, Immersive Reality: The Future of Human Interaction.* Los Angeles: University of Southern California. p. 7 [↑](#footnote-ref-13)
14. http://grantome.com/grant/NSF/EEC 9529125 [↑](#footnote-ref-14)
15. The three Earthquake Engineering Research Centers began operation outside the ERC Program and consequently lacked engineered systems visions at their start-up. That was addressed when they were folded into the ERC Program. [↑](#footnote-ref-15)
16. http://grantome.com/grant/NSF/EEC 9701568 [↑](#footnote-ref-16)
17. http://grantome.com/grant/NSF/EEC 9701785 [↑](#footnote-ref-17)
18. http://grantome.com/grant/NSF/EEC 9701471 [↑](#footnote-ref-18)
19. http://grantome.com/grant/NSF/EEC 9731680 [↑](#footnote-ref-19)
20. http://grantome.com/grant/NSF/EEC 9731643 [↑](#footnote-ref-20)
21. http://grantome.com/grant/NSF/EEC 9731748 [↑](#footnote-ref-21)
22. http://grantome.com/grant/NSF/EEC 9731725 [↑](#footnote-ref-22)
23. http://grantome.com/grant/NSF/EEC 9731677 [↑](#footnote-ref-23)
24. http://grantome.com/grant/NSF/EEC 9876363 [↑](#footnote-ref-24)
25. https://www.nsf.gov/pubs/2000/nsf00137/nsf00137r.htm [↑](#footnote-ref-25)
26. http://grantome.com/grant/NSF/EEC 9986821 [↑](#footnote-ref-26)
27. ERC Program, Current ERCs with Visions by Cluster\_FY 2017.doc (Preston and Lewis Files – Need to go online) [↑](#footnote-ref-27)
28. http://cebc.ku.edu/about [↑](#footnote-ref-28)
29. ERC Program, op. cit [↑](#footnote-ref-29)
30. Ibid. [↑](#footnote-ref-30)
31. Ibid. [↑](#footnote-ref-31)
32. Ibid. [↑](#footnote-ref-32)
33. Ibid. [↑](#footnote-ref-33)
34. Ibid. [↑](#footnote-ref-34)
35. Ibid. [↑](#footnote-ref-35)