Ronald C. Lasky, Ph.D., PE

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Experience

2002-Present: Instructional Professor at the Thayer School of Engineering at Dartmouth College, Director of the Thayer's Cook Engineering Design Center, Senior Technologist at Indium Corporation

- Developed and taught a new course at the Thayer School on design for manufacturability, incorporating statistical techniques of design of experiments, statistical process control, cost analysis and technical estimating. The course emphasized electronic, optoelectronic assembly and manufacturing processes.
- Enhanced a graduate course on engineering statistics. Developed new concepts and examples to help students to "think statistically."
- Developed a new course, for non-engineers, on the impact of materials on civilization.
- Co-taught Thayer School's engineering capstone course 190-290.
- Principle Investigator on an NHIRC grant with Graphicast Corporation to optimize their casting and machining processes.
- Developed a course and text on optoelectronic assembly with SMT Plus.
- Developed SMTA and industry engineering certification programs
- Developed *A Protocol for WEEE/RoHS Compliance* with Dartmouth Students
- Developed a "best of breed" Lean Six Sigma Green Belt, Brown Belt and Black Belt programs at Dartmouth: http://engineering.dartmouth.edu/sixsigma/
- Senior technologist Indium Corp in electronic and optoelectronic packaging and assembly. Wrote numerous articles and book chapters on these topics, developed SMT process software and cost modeling tools
- Established the first "blog" in the electronics assembly industry: http://www.indium.com/drlasky/
- Developed a course and text on lead-free assembly with SMT Plus

1995-2001: Chief Scientist, Director of Technology, Consulting Director for Manufacturing Operations Cookson Electronics

(14 independent divisions, 6000 persons, sales $1.3 Bn pa)

- As Consulting Director, lead a team of consultants in assessing and developing improvement plans for electronic manufacturing operations around the world. In this role developed SPC, DOE, DFM and process productivity tools and methods for this industry. Wrote numerous articles on these topics in SMT, EPP and Circuits Assembly magazines.
- As Director of Technology, direct the synergistic technical strategy for this group of independently minded companies.
- Assisted by one colleague, developed a certification program for SMT process engineers.
- Developed quantitative models that indicated productivity replaced quality as the issue in electronics assembly. This provided the groundwork to establish a productivity services company within Cookson Electronics (CED). This new company is developing productivity products for the $300 billion electronics packaging industry.
- With Dartmouth College, invented SPACE, the first cost estimating software for the entire assembly process. Worked with a team from Dartmouth College to make SPACE user friendly. It is now widely used in CED. This tool not only enabled strategies to fight the "commoditization" of Cookson products, but also to develop and implement a strategy to make flip chip a standard SMT process: FC=SMT^{TM}. SPACE

estimates that FC=SMT™ will save CED customers $2B/yr. The first FC=SMT™ product was delivered on schedule and on budget in late 1999.

- Principal Investigator, leading a 15 person team, in submitting a $7M proposal, "Parallel/Data Driven Printing," for electronic materials to NIST. CED was a finalist to receive the grant.
- Critical Analysis Consultant to ARPA, troubleshooting a low cost gigabit optoelectronic technology that was being developed by EGG and Raytheon.
- Developed CED Customer Technology Seminars now run by a team of 15.
- Organised and chaired intra-division Technology Summits for senior technologists. Developed all the content for CED's Multimedia Technology Roadmap while working with an intra-divisional team. Responsible for developing CED's product marketing brochure.
- Consultant to the Defense Department
- Recognised expert in Electronics and Optoelectronics Assembly

1993-1995: Director of Advanced Technology, Universal Instruments

- Responsible for the UFP, Solder Jet and BGA/DCA Consortia. During this period Universal developed a worldwide reputation. This success story was chronicled in Business Week.
- Established the fundamental understanding that parallel and data driven assembly processes were the driving forces in adding the most value in electronic assembly. This concept is fundamental now in equipment design in CED and other companies.

Through 1993: Manager and Senior Engineer, IBM Corporation

- Specializing in electronic and optoelectronic packaging.
- Developed a new technical approach to defining and testing the optical "interface" between optoelectronic transceiver modules. Monte Carlo software was written to support this analysis. From this work came the first book on optoelectronics for data communication.
- Led one of three teams to develop optoelectronic transceiver modules. Overall development budget $150m.
- Responsible for all of the materials engineering support for a revolutionary printed circuit board which was the electronic packaging foundation for IBM 3081 and 3090 mainframe systems. This PCB is still the high technology standard in the industry.
- Responsible for the development and product release of component packages at IBM Endicott.

Publications etc.

- Editor of Text Books*: Principles of Electronic Packaging, Optoelectronics for Data Communications,* and *Handbook of Optoelectronics for Data Communication*
- Author of *Critical Issues in Electronics Assembly*, which became a six part series in Electronic Packaging & Production magazine.
- Author of: *Beyond a Reasonable Doubt: Evidence for a Designed Universe*
- Founder of the *The Institute for Optical Data Communication*
- Author of Patents, Patent Publications and numerous technical papers

SMT Software

- Developed cost estimating software ProfitPro™
- Developed SMT Process Software: StencilCoach™, ReflowCoach™, WaveCoach™, LineSimulator™

Ronald C. Lasky, Ph.D., PE

Academic Experience

- Taught mathematics through differential equations, complex variables, statistics, and calculus of variations; graduate materials science, mechanical engineering and physics as an Adjunct Professor at numerous universities
- Lecturer and teacher at: Princeton, Cornell, Cal Tech, Dartmouth, Yale, West Point, SUNY at Binghamton, Broome Community College and the National Security Agency
- Member of IEEE, NEMI, Bomische Physical Society, IMAPs, and SMTA

Education

- Ph.D. Materials Science, GPA: 3.96, Cornell University, Ithaca, NY, 1986
- Professional Engineer, New York State, 1976
- MS, Applied Math, Binghamton University, Binghamton, NY, 1974
- BS with Distinction, Engineering Physics, Cornell University, Ithaca, NY, 1970
- AS, Engineering Science, Broome Community College, 1967

Languages

- Minitab, Visual basic
- Powerpoint, Excel, Word, Windows 7

Papers

1. R. C. Lasky, etal, *Moisture Solubility and Diffusion in Epoxy and Epoxy Glass Composites*, The IBM Journal of Research and Development, Vol 28, No. 6, November 1984.
2. R. C. Lasky, Ph.D., Thesis, Cornell University, 1986.
3. C.-Y. Hui, K.-C. Wu, R.C. Lasky and E.J. Kramer, "Case II Diffusion in Polymers I: Transient Swelling", (MSC Report # 5826) J. Appl. Phys., 61 5129-5136 (1987).
4. C.-Y. Hui, K.-C. Wu, R.C. Lasky and E.J. Kramer, "Case II Diffusion in Polymers II: Steady State Front Motion", (MSC Report #5844) J. Appl. Phys., 61 5137-5149 (1987).
5. C.-Y. Hui, K.-C. Wu, R.C. Lasky and E.J. Kramer, "Chemically-Driven Deformation of Polymers", (MSC Report #5851) Trans ASME , J. of Electronic Packaging, 111 68-73 (1989).
6. R.C. Lasky, E.J. Kramer and C.-Y. Hui, "The Initial Stages of Case II Diffusion at Low Penetrant Activities", (MSC Report #6148), Polymer, 29 673 (1988).
7. R.C. Lasky, E.J. Kramer and C.-Y. Hui, "The Temperature Dependence of Case II Diffusion", (MSC Report #6184), Polymer, 29 1131 (1988).
8. T. P. Gall, R. C. Lasky and E. J. Kramer, "Case II Diffusion: Effect of Solvent Molecule Size", MSC Report #6706, Polymer, 31, 1491-1499 (1990).
9. R. G. Bayer, R. Ginsburg, R. C. Lasky, *Settleable and Airborne Particles in Industrial Environments*, pp 155-166, Proceedings of the 35th IEEE Holm Conference, September 1989, Chicago.
10. R. C. Lasky, etal., *Use of Surface Analysis Techniques in Electronic Packaging*, pp 323-329, ASM Conference Proceedings 3rd Electronic Materials & Processing Congress, San Francisco, August 1990.
11. V. Lundell, T. Kellerman, R.C. Lasky, *Reliability Criteria for Data Communication Fiber Optic Cables/Connectors*, pp 209-214, ASM Conference Proceedings in Materials Developments in Microelectronic Packaging: Performance and Reliability, 1991.
12. D. P. Clement, U. Osterberg, R. C. Lasky, *Analytical Coupling Model for Obliquely polished single-mode cables,* IEEE Photon. Techno. Lett. 5, 1422-1444.
13. M. D. Snyder, R. C. Lasky, *Overview of Solder Jetting*, Proceedings of the Materials Research Society, Spring 1995, San Francisco, CA.

14. R. C. Lasky, *Critical Issues in Electronics Assembly,* Circuits Assembly Magazine, Fall 1995- Winter 1996.
15. R. C. Lasky, *Critical Issues in Electronics Assembly,* Electronic Packaging and Assembly Magazine, Fall 1997-Winter 1998.
16. R. C. Lasky. D. Baldwin, B. Lewis, *Metrics: The Key to Productivity*, Proceedings of the IPC/SMTA Electronics Assembly Expo 1998, Providence, RI.
17. R. C. Lasky, D. Baldwin, *Cost Estimating To Maximize Profit by Monitoring and Improving Cost Metrics*, Proceedings of NEPCON 1999, Anaheim, CA.
18. R. C. Lasky, Y. Y. Morvan, *What is Needed to Establish Flip Chip as a Standard SMT Process*, Proceedings of NEPCON 1999, Anaheim, CA.
19. D. Baldwin, R. C. Lasky, J. Belmonte, K. Murray, *Real Time Cost Estimates Measure ROI*, pp 46-52, SMT Magazine, Sept 1999.
20. R. C. Lasky, A. Rae, Y. Morvan, *Critical Issues in Electronics,* 2nd Singapore SMTA Seminar "SMT in the New Millenium", 15 October 1999, Royal Crowne Plaza Singapore.
21. R. C. Lasky, A. Rae, *Economic Considerations of Lead Free Assembly,* 2nd Singapore SMTA Seminar "SMT in the New Millenium", 15 October 1999, Royal Crowne Plaza Singapore.
22. R. C. Lasky, *Real Time Costing as a Tool to Improve Profitability,* Proceedings of APEX 2000, Los Angeles, CA**.**
23. R. C. Lasky, *Small Process Improvements Equal Large Profits,* Proceedings of the SMTA International Conference, September 24-28, 2000, Chicago.
24. M. Mukadam, D. Santos, S. Dalton, R. C. Lasky, *Process Modeling to Maximize Productivity and Profit in BGA Assembly,* Proceedings of APEX 2001, San Diego, CA.
25. J. Belmonte, R. C. Lasky, D. Santos, *A Production and Profit Simulation of a Superfactory,* Proceedings of APEX 2001, San Diego, CA.
26. G. Jones, R. C. Lasky, Electronic Packaging and Production Magazine, June 2001
27. R. C. Lasky, Prashant Chouta, *Critical Issues in Optoelectronic Assembly*, pp 1-5, Proceedings of the Technical Program: Optoelectronics and the Telecom Revolution, SMTA, Dallas, November 14-15, 2001.
28. R. C. Lasky, J. L. Morvan, *Fundamentals and Challenges in Optoelectronic Assembly*, Proceedings of the Technical Conference, APEX, San Diego, January 22-24, 2002.
29. R. C. Lasky, K. A. Lasky, J. A. Su, *Throughput Estimator for SMT Productivity a Low Cost Tool* , Proceedings of the Technical Conference, APEX, San Diego, January 22-24, 2002.
30. J. Belmonte, R. C. Lasky, *A Guide to Assessing the Performance of Your Manufacturing Operation*, Proceedings of the Technical Conference, APEX, San Diego, January 22-24, 2002.
31. R. K. Warren (R. C. Lasky etal "ghost writers") , *Proceedings of the 41st Electronic Components Technology Conference,* Atlanta, GA, May 11-16, 1991, pp161-168, IEEE Pubs.
32. R. C. Lasky, *The Greatest Challenge for Electronic Assembly*, EPP Magazine, 2002
33. R. C. Lasky, Mark O'Neil, *The Importance of Incremental Uptime in the Assembly of High Value PCBs*, to be published SMT Magazine, 2003 .
34. R. C. Lasky, T. Jensen, *Assembling Chip Scale Packages with High Yields*, Chip Scale Review, Nov-Dec 2002.
35. R. C. Lasky, Daryl Santos, Pohly Doug, *Establishing a Continuous Improvement Plan to Dramatically Increase Profit*, at SMTAI, Chicago, IL, Sept 2002.
36. R. C. Lasky, Jensen, T., *Practical Tips in Implementing the "Pin in Paste" Process*, at SMTAI, Chicago, IL, Sept 2002.
37. R. C. Lasky, *Materials and Process Challenges In RF And Optoelectronics Assembly*, at SMTAI, Chicago, IL, Sept 2002
38. R.C. Lasky, R. H. Short, *A Self Assessment Software Tool for SMT Processes and Productivity Optimization*, APEX, Anaheim, April 2003.

39. R.C. Lasky, Daryl. Santos, J. R. Cloyd, *An Effective Design of Experiment Strategy to Optimize SMT Processes* APEX, Anaheim, April 2003.
40. R. C. Lasky, *Unraveling the Twin Paradox*, Scientific American Website: http://sciam.com/print_version.cfm?articleID=000BA7D8-2FB2-1E6D-A98A809EC5880105
41. R. C. Lasky, Amey Teredesai, Daryl L. Santos, *Questioning the Need for Automation in Optoelectronic Assembly*, presented at the Optoelectronics Microsystem International, Ottawa, CN, 28 April-1 May 2003.
42. R. C. Lasky, D. Santos, A. A. Bhave, *Leaded and Lead-free Solder Paste Evaluation Screening Procedure*, at SMTAI, Chicago, IL, Sept 2003
43. R. C. Lasky, *Tin Pest: A Forgotten Issue in Lead-free Soldering?*, at SMTAI, Chicago, IL, Sept 2004
44. R. C. Lasky, *Time and the Twin Paradox*, Scientific American Special, ppf 20, Volume 16, Number 1, 2006.
45. R.C. Lasky, *The Procrastinator's Guide to WEEE and RoHS Compliance*, IPC/Soldertec RoHS Conference, Malmo, Sweden 25-27 April 2006.
46. Belmonte, Joseph, Lasky, Ronald, etal, *Process Development for 01005 Lead-Free Passive Assembly: Stencil Printing*, IPC Lead-Free, Boston, December 2006
47. Belmonte, Joseph, Lasky, Ronald, etal, *Process Development for 01005 Lead-Free Passive Assembly: Stencil Printing*, APEX, Los Angeles, February 2007.
48. Lasky, Ronald, Perry, Phillip, *Counterfeit Electronic Component Thereat Looms Large*, Circuitree, June 1, 2007.
49. Bixeman, Michael, Gervascio, Thomas, Lasky, Ronald, *Using Six Sigma Techniques to Optimize Cleaning in Class III Electronics*, SMTAI, Orlando, FL, October 2007.
50. Bratnikov, Alexander, Lasky, Ronald, *Assembly of Large PWBs in a RoHS Environment*, APEX, Las Vegas, NV, April 2008.
51. Mohanty, Rita, Lasky, Ronald, etal*, Investigating the 01005-Component Assembly Process Requirements,* APEX, Las Vegas, NV, April 2008.
52. Jensen, T., Lasky, R.*, Implementing a Halogen Free Assembly Process,* SMTAI, Orlando, FL, Aug 2008.
53. Jensen, T., Harnett A., Lasky, R.*, Halogen-Free Solder Pastes And Fluxes: Implementation Challenges,* SMTAI, San Diego, October 2009.
54. Anglin, C., Briggs, E., Lasky, R., *Fine Feature Stencil Printing 0.3mm Pitch Components,* SMTAI, San Diego, October 2009.
55. Briggs, E, Lasky, R., *Best Practices Reflow Profiling For Lead-Free SMT Assembly*, SMTAI, San Diego, October 2009.
56. Lasky, R. C., *Mathematics Learning Outcomes for Engineers in an Age of Excel®, MATLAB®, etc: Some Observations and Thoughts*, 2010 American Society for Engineering Education Northeast Section Conference, May 7 and 8, 2010, Boston, MA.
57. Briggs, E., Lasky, R. C., *Process Optimization to Prevent the Graping Effect*, SMTA Toronto Expo and Tech Forum, May 19, 2010.
58. Gowans, Carol and Lasky Ronald C., *Applications of Solder Fortification With Preforms*, October 25, 2010, SMTAI 2011, Orlando, FL.
59. Gowans, Carol and Lasky Ronald C., *Applications of Solder Fortification With Preforms*, April 12, 2011, APEX 2011, Las Vegas, NV.
60. Lasky, Ronald C., Tin Pest: Elusive Threat in Lead-Free Soldering, Journal of Failure Analysis & Prevention, Volume 10, Number 6, December 2010 , pp. 437-443(7)
61. Briggs, Edward, Sandy, Brook, and Lasky, Ronald C., *Advantages of Bismuth-based Alloys for Low Temperature Pb-free Soldering and Rework*, SMTA, Toronto, May 2011.
62. Lasky, Ronald C., *Low Silver Solder Alloys with Good Drop Shock and Thermal Cycle Reliability*, September 22, 2011, IPC Mid-West, Chicago, IL.
63. Homer, Seth, and Lasky, Ronald C, *Minimizing Voiding In QFN Packages Using*

Solder Preforms, October 12, 2011, IMAPS, Long Beach, CA.

64. Sandy, Brook, and Lasky, Ronald C., *Choosing A Low-Cost Alternative To SAC Alloys For PCB Assembly: Preliminary Work*, SMTAI, October 16-20, 2011, Fort Worth, TX.
65. Palma, Nicole and Lasky, Ronald C, *Correlation of SIR, Halide/Halogen, and Copper Mirror Tests,* SMTAI, October 16-20, 2011, Fort Worth, TX.
66. Homer, Seth, and Lasky, Ronald C, *Minimizing Voiding In QFN Packages Using Solder Preforms*, SMTAI, October 16-20, 2011, Fort Worth, TX.
67. Sandy, Brook, Lasky, Ronald C., *Choosing a Low-Cost Alternative to SAC Alloys for PCB Assembly*, APEX, February 28-March 1, 2012, San Diego, CA.
68. R. C. Lasky, *Time and the Twin Paradox*, Scientific American Special, ppf 30, Volume 21, Number 1, Spring, 2012.
69. Lasky, Ronald C., Palma, Nicole, *Correlation of SIR, Halide/Halogen, and Copper Mirror Tests,* APEX, February 28-March 1, 2012, San Diego, CA.
70. Homer, Seth, and Lasky, Ronald C, *Minimizing Voiding In QFN Packages Using Solder Preforms (Updated)*, APEX, February 28-March 1, 2012, San Diego, CA.
71. Jensen, Timothy, Lasky, Ronald C., Samiappan, Sehar, *Material and Process Optimization For HIP Defect Elimination*, SMTA SE Asia, April 2012, Penang.
72. Lasky, Ronald, C., *A Focus on Productivity and Profitability: Several Case Studies*, SMTAI, October 16-18, 2012, Orlando, FL.
73. Jensen, Timothy, Lasky, Ronald C., *Material and Process Optimization for HIP Defect Elimination*, APEX 2013, February 19-21, 2013, San Diego, CA.

Web Based Articles

Since 2005 I have published over 50 articles in web based media Re SMT assembly and my Blog http://www.indium.com/drlasky/ has 100s of postings.

Books Published

1. D. P. Seraphim, R. C. Lasky, C. Y. Li, *Principles of Electronic Packaging*, McGraw-Hill, 1989, NY, NY.
2. R. C. Lasky, D. Stigliani, U. Osterberg, *Optoelectronics for Data Communication*, Academic Press, 1995, NY, NY.
3. C. DeCusatis, E. Maass, D. Clement, R. C. Lasky, *Handbook of Fiber Optic Data Communication*, Academic Press, 1997, NY, NY.
4. R. C. Lasky, *Beyond a Reasonable Doubt: Evidence for a Designed Universe*, 1st Books, 2000.
5. R.C. Lasky, *The Adventures of Patty and the Professor*, ISBN: 978-0-615-57887-4, Indium Corporation, Clinton, NY, 2012.

Book Chapters

1. L. L. Marsh, R. Lasky, D.P. Seraphim, G. S. Springer, *Moisture Solubility and Diffusion in Epoxy and Epoxy Glass Composites,* pp 51-62 in *Environmental Effects on Composite Materials*, Technomic Publishing Co, 1988, Lancaster, PA, USA.
2. R. C. Lasky, etal., *Case II Diffusion*, pp 796-808, in *Principles of Electronic Packaging*, McGraw-Hill, 1989, NY, NY.
3. D. P. Clement, R. C. Lasky, D. Baldwin, *Alignment Metrology and Techniques*, pp 633-669, in, *Handbook of Fiber Optic Data Communication*, Academic Press, 1997, NY, NY.

4. Y. Y. Morvan, R. C. Lasky, D. Baldwin, *Market Analysis and Business Planning*, pp 673-703, in, *Handbook of Fiber Optic Data Communication*, Academic Press, 1997, NY, NY.
5. R. C. Lasky, etal., *Introduction*, pp 1-6, in *Optoelectronics for Data Communication*, Academic Press, 1995, NY, NY.
6. J. Radcliffe, C. Paddock, R.C. Lasky, *Integrated Circuits, Transceiver Modules, and Packaging*, pp 127-164, in *Optoelectronics for Data Communication*, Academic Press, 1995, NY, NY.
7. D. P. Clement, R. C. Lasky, L. Brehm, *Connector/Module Interface*, pp 165-217, in *Optoelectronics for Data Communication*, Academic Press, 1995, NY, NY.
8. R. C. Lasky, P. Chouta, A. Singer, *Assembly for Optoelectronics*, Academic Press, 2002.
9. D. P. Clement, R. C. Lasky, D. Baldwin, *Alignment Metrology and Techniques*, in, *Handbook of Fiber Optic Data Communication*, Academic Press, 2008, NY, NY.

Presentations/Workshops

1. *Scanning Electronic Microscopy as a Failure Analysis Tool,* Binghamton University, Spring 1978.
2. *The Challenges of Implementing a New Resin in PWB Manufacturing*, Cornell University, 1983, 86, 87, 93, 95, 96
3. *Technical Estimating: The Second Most Important Skill*, Cornell University 1988, 89, 96, 97, 98, 99, 2000, Dartmouth 1997.
4. *Job Interviewing: A View from the Other Side*: Binghamton University 1991, Dartmouth 1996, 1997.
5. *Tips for Success*: Dartmouth 1997
6. *Electronic Assembly*: USMA at West Point, 1996.
7. *Economic Considerations of Lead Free Processing*, Lead Free Soldering and Interconnection Symposium, Binghamton University, December 6-8, 1999.
8. *Critical Issues in Optoelectronic Assembly*, International Electronics Packaging Symposium, Binghamton University, June 25-27, 2001.
9. *Beyond a Reasonable Doubt: Evidence for a Designed Universe*, Cornell 1999, Purdue 1999, MIT 2000, Wheaton College 2000, Boston University 2001, University of Connecticut, Harvard 2001, Bowdoin College 2001, Bates College 2001, Colby College 2001, Bates College 2002.
10. *Fundamentals of Optoelectronics*, Cal Tech 1992, Dartmouth 1992, Cornell 1992, Yale, 1992, Princeton 1992.
11. *Fundamentals of Optoelectronic Assembly*, SMTA Dallas 2001, APEX, SMTA Toronto, SMTA Nepcon East 2002.
12. *Critical Issues in Electronic Assembly*: 1997-2002 more than 20 times.
13. *Design for Manufacturability in SMT Assembly*, SMTA Toronto, RIM 2002.
14. *Stencil Printing Using Software Tools*, SMTA Nepcon East 2002.
15. *Challenges in Optoelectronic Assembly,* 2001-2002 more than 10 times.
16. *Auditing Your SMT Facility for Maximum Profitability*: Libra 2002, Leitch 2002.
17. *Trends in Electronic Assembly*, IEEE Boston, Fall 2004.
18. *Trends in Electronics*¸ IEEE Boston, Fall 2006.
19. *Trends in Electronics, Counterfeit Components, WEEE/RoHS Overview, Applying SPC to SMT, CONCIBE 2007,* Guadalajara, MX.
20. *Alloy Convergence in Lead-Free Assembly,* Philips Corp, February, 2008.
21. *Lead-Free Assembly of Large PWBs,* APEX, Las Vegas, March 2008.
22. *Beyond RoHS: Sustainable Design, How to Interview for a Job, CONCIBE June 2008,* Guadalajara, MX.
23. *Halogen Free Electronic Assembly*, SMTAI, Orlando, August 2008,
24. *Trends in Electronics 2008, SMTAI,* August 2008, Orlando Florida.
25. *The Threat of Counterfeit Components, SMTAI,* August 2008, Orlando Florida.

26. *DOE and Statistics for Cellulosic Ethanol Research*, Mascoma Corp, Lebanon, NH, 2008.
27. *Minimizing Defects in Lead-Free Assembly,* JEDEC/IPC, Dallas, December 2008.
28. *SMT/Electronics: The Next 25 Years,* Keynote speaker, SMTAI, San Diego, October, 2009
29. *Lead-Free Assembly for High Yields and Reliability,* APEX, Las Vegas, April 2010.
30. *Lead-Free Alloy Proliferation*, SMTA Boise, Idaho, April 9, 2010.
31. *The Impact of RoHS*, Jones Seminar, Thayer School, Dartmouth, April 29, 2010.
32. *Solder Sphere Head-in-Pillow: Causes and Solutions*, IMAPS, Marlboro, MA, May 4, 2010.
33. *Mitigating Graping and the Head-in-Pillow Defects,* June 9, 2010, SMTA Mn-StP, MN.
34. *01005 Passive and 0.3 mm CSP Stencil Printing,* September 21, 2010, SMTA Capital Expo, John Hopkins University, Laurel , MD.
35. *Mitigating Graping and the Head-in-Pillow Defects*, September 21, 2010, SMTA Capital Expo, John Hopkins University, Laurel , MD.
36. *Establishing a High-Yield, Pb-free Process, including Ultra Fine Pitch Printing for Passives and CSPs***,** October 7, 2010, SMTA Austin, TX.
37. *Mitigating Graping and the Head-in-Pillow Defects,* November 17, 2010, SMTA Nutmeg Meeting, Hartford, CT.
38. *The Proliferation of Lead-Free Alloys*, May 3, 2011, IMAPS New England, Boxboro, MA.
39. *Electronics: Evolution or Revolution*, Cook Seminar, Dartmouth College, Hanover, NH.
40. *Optimizing a Miniaturized PCB Assembly Process in a Lead-Free, Halogen-Free Era,* April 10, 2011, APEX 2011, Las Vegas, NV.
41. *Lead-Free Assembly for High Yields and Reliability*, April 11, 2011, APEX 2011, Las Vegas, NV.
42. *An Introduction to Sampling*, June 10, 2011, SBE Electronics, Barre, VT.
43. *Lead-free Assembly for High Yields and Reliability*, September 22, 2011, IPC Mid-West, Chicago, IL.
44. *A Status of Lead-Free Assembly: A Perspective,* PERM meeting, September 27, 2011, Naval Surface Warfare Center, Crane, IN.
45. *Lead-free Assembly for High Yields and Reliability,* ACI, December 6 and 7, 2011, Philadelphia, PA.
46. *Lead-free Assembly for High Yields and Reliability,* APEX, February 26, 2012, San Diego, CA.
47. *A Focus on Productivity, Graping and the Head in Pillow Defect, Solder Preforms for PIP*, given to valor Electronics, Kyocera and
48. *An Overview of Weibull Analysis*, Indium Corporation, December 2012.
49. *Lead-free Assembly for High Yields and Reliability,* APEX, February 2013, San Diego, CA.

Courses Taught

Undergraduate

	Course	**Year**	**Institution**
1.	Calculus I	1974-79	IBM
2.	Calculus II	1974-79	IBM
3.	Advanced Engineering Math I	1974-79	IBM
4.	Advanced Engineering Math II	1974-79	IBM
5.	Physics I	1980-81	Broome Community College
6.	Physics I	1981-83	Binghamton University
7.	Electronic Packaging	1985-87	Cornell University
8.	Materials Science	1987	Broome Community College
9.	Science and Society	1993-95	Davis College
10.	Materials: The Substance of Civ	2004-12	Dartmouth College
11.	The Technology of Everyday Things	2009-13	Dartmouth College

Ronald C. Lasky, Ph.D., PE

Graduate

1.	Metallurgy	1990	Binghamton University
2.	Mechanics	1991	Binghamton University
3.	Polymer Engineering	1992	Binghamton University
4.	Mechanical Vibrations	1992	Binghamton University
5.	Fracture Mechanics	1993	Binghamton University
6.	DOE, SPC, DFM	2002-12	Dartmouth College
7.	Probability and Statistics	2003-12	Dartmouth College
8.	Design Methodology I	2005-8	Dartmouth College
9.	Design Methodology II	2006-8	Dartmouth College

Industrial

1. Surface Mount Assembly Processes 2000-02 Cookson Electronics, SMTA, Indium Corp
   - Printing, Dispensing, Placement, Reflow, Wave, Cleaning, Test
2. Surface Mount Assembly Systems 2000-02 Cookson Electronics, SMTA, Indium Corp
   - DOE, SPC, DFM, Costing
3. Developed and delivered SMTA's 2002-13 SMTA
   SMT Certification Courses
4. Math Refresher courses, numerous times
5. Dartmouth Six Sigma Green Belt, Black Belts and Master Black Belt Workshops (approx 35) 2005-2013
6. Preparing Your Factory for Lead Free Assembly, over 20 times 2003-2008
7. WEEE/RoHS Compliance, over 25 times 2004-2010
8. SMT Cost Estimating, over 5 times from 2003-2009

Awards:

IBM Outstanding Technical Contribution Award 1981
IBM Outstanding Technical Achievement Award 1991
IBM 1st Level Patent Award
IBM Publications Award Levels I-IV
SMTA Founders Award 2003

Affiliations

1. IEEE (past)
2. IMAPS
3. SMTA
4. MRS (past)
5. Bohmische Physical Society (past)
6. Member of the NOI's Scientific Advisory Committee 1992-95, Quebec City.

Patents:

1. Number 5,631,987: Low Cost, Mode Filed Matched, High Performance, Laser Transmitter Optical Subassembly.
2. Number 6,572,702: High Speed Electronic Assembly System and Method
3. Twelve patent publications in materials, materials analysis and electronic packaging

Misc.

I was the Principle Investigator on a $3M NIST proposal, *Parallel and Data Driven Materials Deposition*, April 1999. The proposal made it to the finals.

I was on SMT Magazine's Technical Advisory committee from 2004-2007.