BILLY J. STANBERY

Research Scientist, Innovator, Entrepreneur, Mentor, and Leader

Curriculum Vitae

5404 Abilene Trail
Austin, TX 78749 USA

mobile: *+1 (512) 925-1810*
email: *bjsuwpv@uw.edu*

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STATEMENT OF CAREER OBJECTIVE

My career goal is to leverage my experience, creativity, skills, and interpersonal network to effectively help create a more just and sustainable future for our world. The most effective means to achieve this objective is to apply my organizational and fund-raising skills towards a combination of: (1) continuing and publishing research which helps bring the next generation of lower-cost thin film photovoltaic technology to large-scale global deployment while educating future generations of contributors; and (2) leading, team-building, mentoring, facilitating, and collaborating with others who share this goal to translate our work into successfully commercialized and impactfully adopted products and services.

CURRENT POSITIONS

Present

University of Washington, Seattle, WA: Research Professor of Chemical Engineering.

Colorado School of Mines, Golden, CO: Affiliate Professor of Biological and Chemical Engineering.

National Laboratory of the Rockies, Golden, CO.: Joint appointment with Colorado School of Mines.

HelioSourceTech, LLC, Tucson, AZ: Member.

HelioSynergy, LLC, Austin, TX. Manager.

EDUCATION

2001

University of Florida, Gainesville, Florida. *Ph.D. in Chemical Engineering*. Advisor: Professor Timothy J. Anderson. Dissertation title: "Heteroepitaxy and Nucleation Control for the Growth of Metal Chalcogenides Using Activated Reactant Sources". Central research areas: growth of copper indium selenide thin films, computational materials modeling utilizing thermochemical reaction theory, microwave hybrid ECR helicon plasma source design, and rotating disc migration enhanced epitaxy reactor design and process development.

1982

University of Washington, Seattle, Washington. *M.S. Degree in Physics*. Advisors: Professor Martin Gouterman (Chemistry) and Professor Samuel Fain (Physics). Central research areas: ultrahigh vacuum studies of metalorganic porphyrin semiconductor thin film photovoltaic cell device physics in the Laboratory of Porphyrin Electro-Optics.

1977

University of Texas, Austin, Texas. *B.S. Degree in Physics with High Honors.* Advisor: Professor Melvin Oakes. Senior honors independent studies with 1977 Nobel Laureate Professor Ilya Prigogine. Senior research experimental project on

superconducting quantum interference device fabrication. Fusion Research Center Tokamak instrumentation technician.

1977 **University of Texas,** Austin, Texas. *B.S. Degree in Mathematics with Honors.* Advisor: Professor William Guy. Elective courses emphasizing mathematical analysis, integral transforms, linear differential operators, and tensor field theory.

WORK EXPERIENCE

01/25-Present **Research Professor, University of Washington,** Seattle, WA: Member of the Clean Energy Institute.

02/22-Present **Research Professor, Colorado School of Mines,** Golden, CO: Joint appointment with the National Renewable Energy Laboratory.

05/21-Present **Owner, HelioSynergy, LLC,** Austin, TX. Responsibilities: Due diligence for investors and consultant to government agencies and commercial corporations under NDA.

03/20-Present **Partner, HelioSourceTech, LLC,** Tucson, AZ. Responsibilities: Photovoltaic module manufacturing tool design and process modeling.

03/17-12/19 **Chief Science Officer, Siva Power, Inc.** Responsibilities: pilot full-scale reactive co-deposition (RCD) reactor mass transport and thermal modeling, and production process development; transfer function model-based process control automation; metrology and data science infrastructure development for multivariate and functional analysis; statistical design of experiments for process optimization.

03/15-03/17 **President, Siva Power, Inc.,** San Jose, California. Responsibilities: equity investment fund-raising; product roadmap and cost modeling; corporate financial management and public relations.

2001-2014 **Founder, HelioVolt Corporation,** Austin, Texas. Served as Chief Executive Officer 2001-2008, as Chief Strategy Officer 2009-2012, and Chief Science Officer 2012-2014. Raised $233M private equity investment. Built a team of 115 employees supporting pilot manufacturing operation of UL & IEC-certified 0.6×1.2-meter monolithically integrated modules with best production campaign achieving 14.7±0.2% AM1.5G total-area efficiency with 92% yield and champion module efficiency of 15.0%. Initiated and managed a Cooperative Research and Development Agreement (CRADA) with the National Renewable Energy Laboratory (NREL) for ten years that resulted in numerous patents and the 2008 Editor's Choice R&D 100 Award. HelioVolt Technical Advisory Panel chaired by Nobel Laureate Dr. Arno Penzias, former Chief Scientist of Bell Laboratories.

1978-1994 **Engineer, The Boeing Company,** Seattle, Washington. Responsibilities: 1978-1982, Senior Microelectronics Engineer with the Electronics Support Division of the Boeing Aerospace Company developing fabrication processes for very high-power silicon concentrator solar cells; designed and operated an advanced computer-controlled concentrator solar cell test facility; served as a consultant at Boeing on an Air Force SMATH V subcontract for the development of metallization systems and device configurations for high-temperature silicon cell applications; 1982-1985: Responsible for device design and manufacturing process development for large area $CuInSe_2$ solar cell and module technology; 1985-1988: Initiated collaborative development of thin film CLEFT GaAs/CIS tandem solar cells with MIT Lincoln Laboratories and its spin-out Kopin Corporation, culminating in a 25.8% AM1.5G mechanically stacked tandem listed as the world record multijunction thin-film device in *Prog. Photovolt: Res. Appl., Solar Cell Efficiency Tables* from 1990-2008; 1988-1994: Senior Principal Engineer at the Boeing Electronic Company High Technology Center, managing its terrestrial photovoltaic program, including three contracts with NREL, "Photovoltaic Manufacturing Technology: Phase 1", "A New Source of Hydrides for Epitaxial Growth", and "Research in Polycrystalline $CuInGaSe_2$ Solar Cells." Led the team that set what was at the time the record for CIGS thin film cell efficiency (achieved under the last contract) of 14.6% AM1.5G. 1994: Negotiated donation of Boeing's key CIGS research equipment to the University of Florida's Microfabritech facility, as part of a technology transfer to pursue doctorate.

ACADEMIC PROJECTS

1994-2000 **University of Florida,** Gainesville, Florida. Wrote the seminal technical proposal to the U.S. Department of Energy's National Renewable Energy Laboratory (NREL) Thin Film Photovoltaic Partnership Program that won the competitive procurement award which funded the establishment of a multidisciplinary photovoltaics research program at the university across the departments of Chemical Engineering, Materials Science and Engineering, and Electrical Engineering. Directly engaged in coordinating collaborative research between faculty's principal investigators and teambuilding among fellow students while building the Plasma Migration Enhanced Epitaxy (PMEE) reactor laboratory and taking all required graduate level courses in Chemical Engineering. Served as the teaching assistant for several undergraduate courses including kinetics and process thermodynamics. My dissertation was published by NREL as the final report for that contract (http://www.nrel.gov/docs/fy01osti/30391.pdf) and research continued under funding from several follow-on contracts for many years. A vibrant PV academic research community thrives at UF to this day.

1987-1988 **Boeing Outstanding Engineering Fellow, Center for Advanced Engineering Study,** Massachusetts Institute of Technology, Cambridge, Massachusetts. Research on radical-beam-assisted heteroepitaxy of ZnSe on GaAs with Professor Herbert Sawin in the Department of Chemical Engineering. This project was part

of a larger multidepartment effort to explore the potential use of ZnSe/GaAs heterostructures for blue LED and MISFET applications. My interest was driven by the prospect of using these structures as part of a monolithically integrated (Al,Ga)As/$CuInSe_2$ tandem cell. It also motivated my interest in the use of activated reactant sources for epitaxial growth and subsequent development of the hybrid ECR helicon evaporation source cracker whose development was funded by NREL and incorporated into the rotating disc PMEE reactor at UF.

AWARDS

2008	**R&D 100 Editor's Choice Most Revolutionary Technology Award Winner:** NREL and HelioVolt for "Hybrid CIGS combining non-vacuum liquid chemical precursors with *FASST*© Process"
2007	**IDTechEx Printed Electronics Award 2007,** Best New Product Development
2006	**Wall Street Journal Technology Innovation Award:** *FIRST PLACE*, Energy and Power
2006	**Time Magazine's Best Innovations of 2006** for *FASST*™ Process
2006	**Nanotech Briefs' Nano50 Award** for *FASST*™ Process
2006	**Frost & Sullivan Innovation Award** for Thin-Film Photovoltaics
1994	**R&D 100 Award:** Boeing Aerospace Corporation for "Copper Indium Selenide/ Cadmium Zinc Sulfide Solar Cell"
1976	Sigma Pi Sigma (honorary academic society for physics)
1976	Pi Mu Epsilon (honorary academic society for mathematics)
1974	Phi Beta Kappa, Alpha Chapter of Texas

PROFESSIONAL AFFILIATIONS

Current		American Physical Society
	2026	Topical Group on Energy Research and Applications [GERA] Executive Committee, Chair
	2025	Topical Group on Energy Research and Applications [GERA] Executive Committee, Chair-Elect
	2024	Topical Group on Energy Research and Applications [GERA] Executive Committee, Vice-Chair
	2023	Topical Group on Energy Research and Applications [GERA] Executive Committee, Member-at-Large
Current		Institute of Electrical and Electronic Engineers, Senior Member
	2026	Global Outreach Committee Co-Chair, 9th World Conference on Photovoltaic Energy Conversion [WCPEC-9] Daejeon, Korea
	2012-Present	Member of the Cherry and International Advisory Committees, IEEE Photovoltaics Specialists Conference
	2013	Chair of the Cherry Committee, 39th IEEE Photovoltaics Specialists Conference, (PVSC 39) Tampa, Florida
	2012	General Chair, 38th IEEE Photovoltaics Specialists Conference, (PVSC 38) Austin, Texas

2011	Deputy Chair and Secretary, 37th IEEE Photovoltaics Specialists Conference, (PVSC 37) Seattle, Washington
Current	American Institute of Chemical Engineers, Senior Member, Advanced Manufacturing and Processing Society [AMPs]
Current	Materials Research Society
Current	The Minerals, Metals & Materials Society (TMS), Materials Processing & Manufacturing Division
	American Association for Crystal Growth
	American Vacuum Society
	Society of Vacuum Coaters

ADDITIONAL PROFESSIONAL ACTIVITIES

2020-present	**Industry Advisory Board member, U.S. Manufacturing of Advanced Perovskites** (US-MAP)
2016-present	**Industry Advisory Board member, Durable Module Materials Consortium** (DuraMAT)
2020-2022	**Executive Board advisor, US Manufacturing of Advanced Perovskites Consortium (US-MAP)**
2011-2018	**Executive Board member, Bay Area PV Consortium** (BAPVC)
2013-2014	**President, Texas Solar Energy Industry Association** (TXSEIA)
2013	**Metrology Working Group Leader, The U.S. CIGS Photovoltaic Roadmap** (PVMC/SEMATECH, Inc.)
2012	**President, Texas Renewable Energy Industry Alliance** (TREIA)
2008-2012	**Director, Texas Foundation for Innovative Communities** (TFIC)

SERVICE AS SCIENTIFIC REVIEWER

JOURNALS

2006-Present	***Service as reviewer*** for major peer-refereed journals in physics, materials science, electrochemistry, thermochemistry, reliability science, and photovoltaics including *Physical Review B, Journal of Applied Physics, Applied Physics Letters, The Journal of Physical Chemistry, Electrochemical Society Journal of Solid State Science and Technology, Institute of Physics Progress in Energy, Journal of Alloys and Compounds, SPIE Journal of Photonics for Energy, American Chemical Society Nano Letters, Thin Solid Films, Progress in Photovoltaics, Journal of Photovoltaics, and Nature Scientific Reports.*

CONFERENCES

2004-Present	***Service as reviewer*** for several IEEE Photovoltaics Conferences in Area 2 (thin-film photovoltaics)

OTHER

2011-Present	***Service as reviewer*** for consortium funding proposals to the Durable Module Materials Consortium (DURAMAT).
2001-2003	***Service as reviewer*** for U.S. Department of Energy (DOE), Office of Energy Efficiency and Renewable Energy (EERE) funding proposals.

PUBLICATIONS

1 M. Dimitrievska, E. Saucedo, S. De Wolf, B. J. Stanbery, and V. Bermudez Benito, "Lessons from copper indium gallium sulfo-selenide solar cells for progressing perovskite photovoltaics," *Nature Energy*, 2026, https://doi.org/10.1038/s41560-025-01936-0.

2 Alberi, K., Peters, I. M., Verlinden, P., Philipps, S., Koike, A., Barnes, T.,,, Stanbery, B. J.,,, Bett, A. W. "Historical and future learning for the new era of multi-terawatt photovoltaics," *Nature Energy*, 2025, https://doi.org/10.1038/s41560-025-01929-z.

3 D. Colombara, B.J. Stanbery, and G. Sozzi, "Revani diffusion model in Cu(In,Ga)Se_2," *Journal of Materials Chemistry A*, 2023, **11**(48): 26426-26434. https://doi.org/10.1039/D3TA03690A.

4 B.J. Stanbery and J. van de Lagemaat, "Disruptive Photovoltaic Technologies Can Accelerate Global Decarbonization," *2023 IEEE Green Technologies Conference (GreenTech)*, Denver, CO, USA, 2023, pp. 31-34, https://doi.org/10.1109/GreenTech56823.2023.10173795.

5 Stanbery, B.J., Woodhouse, M. and van de Lagemaat, J., Photovoltaic Deployment Scenarios toward Global Decarbonization: Role of Disruptive Technologies. *Solar RRL*, 7: 2300102 (2023). https://doi.org/10.1002/solr.202300102.

6 Haegel, N. M., P. Verlinden, M. Victoria, P. Altermatt, H. Atwater, T. Barnes, C. Breyer, C. Case, S. De Wolf, C. Deline, M. Dharmrin, B. Dimmler, M. Gloeckler, J. C. Goldschmidt, B. Hallam, S. Haussener, B. Holder, U. Jaeger, A. Jaeger-Waldau, I. Kaizuka, H. Kikusato, B. Kroposki, S. Kurtz, K. Matsubara, S. Nowak, K. Ogimoto, C. Peter, I. M. Peters, S. Philipps, M. Powalla, U. Rau, T. Reindl, M. Roumpani, K. Sakurai, C. Schorn, P. Schossig, R. Schlatmann, R. Sinton, A. Slaoui, B. L. Smith, P. Schneidewind, B. Stanbery, M. Topic, W. Tumas, J. Vasi, M. Vetter, E. Weber, A. W. Weeber, A. Weidlich, D. Weiss and A. W. Bett (2023). "Photovoltaics at multi-terawatt scale: Waiting is not an option." *Science* 380(6640): 39-42. https://www.science.org/doi/10.1126/science.adf6957.

7 **Billy Stanbery**, Daniel Abou-Ras, Akira Yamada, and Lorelle Mansfield, "CIGS Photovoltaics: Reviewing an Evolving Paradigm," *J. Phys. D: Appl. Phys.* **55** 173001 (2022). https://doi.org/10.1088/1361-6463/ac4363.

8 Vasilis M. Fthenakis, Marco Raugei, Christian Breyer, Suby Bhattacharya, Michael Ginsberg, Arnulf Jaeger-Waldau, Enrica Lecissi, Daniel Lincot, Dave Murphy, Marc R. Perez, Parikhit Sinha, Angus Rockett, Sascha Sadewasser, BJ Stanbery, Richard Swanson, Pierre Verlinden, Dave Carbajales-Dale, "Critique of the paper: 'Through the Eye of a Needle: An Eco-Heterodox Perspective on the Renewable Energy Transition'," *Energies* ***2022***, *15(3), 971;* https://doi.org/10.3390/en15030971.

9 Gregory M. Wilson, Mowafak Al-Jassim, Wyatt K. Metzger, Stefan W. Glunz, Pierre Verlinden, Gang Xiong, Lorelle M. Mansfield, Billy J. Stanbery, Kai Zhu, Yanfa Yan, Joseph J. Berry, Aaron J. Ptak, Frank Dimroth, Brendan M. Kayes, Adele C. Tamboli, Robby Peibst, Kylie Catchpole, Matthew O. Reese, Christopher S. Klinga, Paul Denholm, Mahesh Morjaria, Michael G. Deceglie, Janine M. Freeman, Mark A. Mikofski, Dirk C. Jordan, Govindasamy TamizhMani, and Dana B. Sulas-Kern, "The 2020 Photovoltaics Roadmap," *J. Phys. D: Appl. Phys.* **53** 493001 (2020).

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11 Sarah E. Sofia, Jonathan P. Mailoa, Dirk N. Weiss, Billy J. Stanbery, Tonio Buonassisi and I. Marius Peters, "Economic viability of thin-film tandem solar modules in the United States," *Nature Energy*, 3, 387–394 (2018).

12 Daniel Abou-Ras, Sigurd Wagner, Bill J. Stanbery, Hans-Werner Schock, Roland Scheer, Lars Stolt, Susanne Siebentritt, Daniel Lincot, Chris Eberspacher, Katsumi Kushiya, Ayodhya N. Tiwari, "Innovation highway: Breakthrough milestones and key developments in chalcopyrite photovoltaics from a retrospective viewpoint," *Thin Solid Films* 633, 2–12, (2017).

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16 G. Yue, D. Lu, K. Moritomo, B. Sang, and B.J. Stanbery, "Electroluminescence and Thermal Imaging of Large-Area Cu(In,Ga)Se_2 Modules," in *The Conference Record of the 39th IEEE Photovoltaic Specialists Conference*. Piscataway: IEEE, 2013, pp. 2068 - 2072.

17 D. Lu, E. P. Christiansen, C. W. Walsh, J. F. Chase, R. M. Miller, M. F. Miller, C. R. Martinez, B. Sang, and B.J. Stanbery, "Metrology and Process Optimization for Large Area Monolithically Integrated Cu(In,Ga)Se_2 Modules," in *The Conference*

Record of the 38th IEEE Photovoltaic Specialists Conference. Piscataway: IEEE, 2012, pp. 1974-1977.

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20 P.A. Hersh, C. J. Curtis, M.F.A.M. van Hest, S. E. Habas, A. Miedaner, D.S. Ginley, and B.J. Stanbery, "Solution-based precursors in conjunction with rapid optical processing for high-quality hybrid CIGS," in *Proceedings SPIE: Thin Film Solar Technology III*, Eldada, L. A., Ed., vol. 8110, Bellingham: SPIE, 2011, 811007.

21 L. Eldada, P. Hersh, B. Sang, B.J. Stanbery, C. Curtis, A. Miedaner, S. Habas, M M.F.A.M. van Hest, and D. Ginley, "High-efficiency low-cost photovoltaic modules based on CIGS thin films from solution precursors," *Materials Research Society Symposium Proceedings* Volume 1247, Cambridge University Press, 2011, pp. C5-1.

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23 **B.J. Stanbery**, L. Peterson, D. Lewin, E. Auerbach, "The Role of Workforce Training and Innovation-Centric Economic Development in Growth of the US PV Market," in *Proceedings of the 25th European Photovoltaic Solar Energy Conference and Exhibition / 5th World Conference on Photovoltaic Energy Conversion*. Brussels: European Commission Joint Research Centre, 2010, pp. 5242-5246.

24 B. Sang, F. Adurodija, M. Taylor, A. Lim, J. Taylor, Y. Chang, S. McWilliams, R. Oswald, B.J. Stanbery, M.F.A.M. van Hest, J. Nekuda, A. Miedaner, C. Curtis, J. Leisch, D. Ginley, "Low cost copper indium gallium selenide by the FASST® process," in *The Conference Record of the 33rd IEEE Photovoltaic Specialists Conference*. Piscataway: IEEE, 2009, pp. 1-4.

25 J.A.N. Malik, M.F.A.M. van Hest, A. Miedaner, C. J. Curtis, J. E. Leisch, P.A. Parilla, M. Kaufman, M. Taylor, B.J. Stanbery, R.P. O'Hayre, and D.S. Ginley, "Atmospheric Pressure Synthesis of In_2Se_3, Cu_2Se, and $CuInSe_2$ without External Selenization from Solution Precursors," *Journal of Materials Research*, vol. 24(4), 2009, pp. 1375-1387.

26 P.A. Hersh, M. Taylor, B. Sang, M.F.A.M. van Hest, J. A. Nekuda, A. Miedaner, C.J. Curtis, J.E. Leisch, D.S. Ginley, B.J. Stanbery, and L. Eldada, "FASST® Reactive Transfer Printing for Morphology and Structural Control of Liquid Precursor Based Inorganic Reactants," *Materials Research Society Symposium Proceedings*, Vol. 1123. Warrendale, PA: Materials Research Society pp. 95-104.

27 L. Eldada, F. Adurodija, B. Sang, M. Taylor, A. Lim, Y. Chang, S. McWilliams, R. Oswald, and B.J. Stanbery, "Development of Hybrid Copper Indium Gallium Selenide Photovoltaic Devices by FASST® Printing Process," in *Proceedings of the 23rd European Photovoltaic Solar Energy Conference and Exhibition*. Brussels: European Commission Joint Research Centre, 2008, pp. 2142-2146.

28 I. L. Repins, B.J. Stanbery, D.L. Young, S.S. Li, W.K. Metzger, C.L. Perkins, W.N. Shafarman, M.E. Beck, L. Chen, V.K. Kapur, D. Tarrant, M.D. Gonzalez, D.G. Jensen, T.J. Anderson, X. Wang, L.L. Kerr, B. Keyes, S. Asher, and A. Delahoy, "Comparison of Device Performance and Measured Transport Parameters in Widely-Varying Cu(In,Ga)(Se,S) Solar Cells," *Progress in Photovoltaics: Research and Applications*. Vol. 14(1) 2006, pp. 25-43.

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30 Yanfa Yan, R. Noufi, K.M. Jones, K. Ramanathan, M.M. Al-Jassim, and B.J. Stanbery, "Chemical Fluctuation-induced Nanodomains in $Cu(In,Ga)Se_2$ Films," *Applied Physics Letters*, vol. 87, 2005, 121904.

31 J. Lazewski, H. Neumann, K. Parlinski, G. Lippold, and B.J. Stanbery, "Lattice dynamics of CuAu-ordered $CuInSe_2$," *Phys. Rev. B: Condens. Matter Mater. Phys.*, **68**, 14, pp. 108-101, (2003).

32 **B.J. Stanbery**, "Copper Indium Selenides and Related Materials for Photovoltaic Devices," *Critical Reviews in Solid State and Materials Sciences*, vol. 27, Boca Raton: CRC Press, 2002, pp. 73-117.

33 **B.J. Stanbery**, S. Kincal, S. Kim, C.H. Chang, S.P. Ahrenkiel, G. Lippold, H. Neumann, T.J. Anderson, and O.D. Crisalle, "Epitaxial Growth and Characterization of $CuInSe_2$ Crystallographic Polytypes," *Journal of Applied Physics*, vol. 91, 2002, pp. 3598-3604.

34 M. Ider, R. Pankajavalli, B.J. Stanbery, W. Zhuang, L.L. Kerr, C.H. Chang, T.J. Anderson, "Cuprous Selenide Defect Equilibria and Homogeneity Range Determined by Coulometric Titration," in *The Conference Record of the 29th IEEE Photovoltaic Specialists Conference*. Piscataway: IEEE, 2002, pp. 680-683.

35 C.H. Huang, Sheng S. Li, W.N. Shafarman, E.S. Lambers, L. Rieth, C.H. Chang, J.W. Johnson, S. Kim, B.J. Stanbery, T.J. Anderson, and P.H. Holloway, "Study of Cd-free buffer layers using $In_x(OH,S)_y$ on CIGS solar cells," *Solar Energy Materials and Solar Cells* 69(2), 131-137, 2001.

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37 **B.J. Stanbery**, S. Kincal, S. Kim, T.J. Anderson, O.D. Crisalle, S.P. Ahrenkiel, and G. Lippold, "Role of Sodium in the Control of Defect Structures in CIS," in *Conference Record of the 28th IEEE Photovoltaic Specialists Conference*. Piscataway: IEEE, 2000, pp. 440-445.

38 C.H. Chang, S. H. Wei, J.W. Johnson, R.N. Battacharya, B.J. Stanbery, T.J. Anderson, and R. Duran, "Long and Short Range Ordering of $CuInSe_2$," *Japanese Journal of Applied Physics*, vol. Suppl. 39-1, pp. 411-412, 2000.

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62 **B.J. Stanbery**, W.S. Chen, R.A. Mickelsen, G. J. Collins, K. A. Emery, J. J. Rocca, and L. R. Thompson, "Silicon nitride anti-reflection coatings for CdS/$CuInSe_2$ thin film

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CONFERENCE AND WORKSHOP PRESENTATIONS

10/28/25 ***LeVass Ventures investor forum 'Synthetic Semiconductors: Innovation to Commercialization for Photovoltaics and Beyond', Memorial City, Houston, TX:*** "Synthetic Semiconductors: Innovation Challenge and Energy Economy Environmental Impact"

06/09/25 ***Industrial Forum, IEEE 53rd Photovoltaics Specialists Conference (PVSC) 2025*, Montreal, CA:** "Accelerating the worldwide development, commercialization and scaling of climate change solutions"

11/13/24 **35th International Photovoltaic Science and Engineering Conference (PVSEC-35)**, Numazu (Mt. Fuji), Japan: "Scale of economic opportunities enabled by disruptive PV technologies"

07/17/24 **Photovoltaic Technology and Innovation Centre (PoTIC), IIT Bombay webinar**: "Materials Manufacturing Process Intensification for TW-Scale PV"

04/19/23 **2023 IEEE Green Technologies Conference (GreenTech),** Denver, Colorado: "Disruptive Photovoltaic Technologies Can Accelerate Global Decarbonization"

06/23/22 **National Nanotechnology Coordinated infrastructure, Oregon State University**: "Materials Manufacturing Process Intensification for TW-Scale PV"

06/08/22 B. J. Stanbery and J. van de Lagemaat, "Achieving Global Decarbonization by Photovoltaic Electrification: Impact of Disruptive Technologies," *2022 IEEE 49th Photovoltaics Specialists Conference (PVSC)*, Philadelphia, PA, USA, 2022, pp. 0168, https://doi.org/10.1109/PVSC48317.2022.9938620.

04/01/22 **Clean Energy Institute Seminar, University of Washington**: "Materials Manufacturing Process Intensification for TW-Scale PV"

05/23/19 ***Invited Speaker:* 2019 IEEE Women in Engineering International Leadership Conference (WIE ILC),** Austin, Texas. Panel on Innovation and cultural change fueling the Energy Revolution in a Sustainable way

03/30/15 **Roadmap for Multi-functional PV Contacts Workshop,** NREL, Golden, Colorado: "Contacts for CIGS PV Modules: Research Dreams and Manufacturing Reality"

03/01/15 ***Invited Speaker:* 2015 APS Spring Meeting Workshop on Energy Research and Applications,** San Antonio, Texas: "Materials Challenges for Photovoltaics"

12/03/13 **2013 Fall MRS Meeting, Symposium W: Next-Generation Inorganic Thin-Film Photovoltaics,** Boston, Massachusetts: "Self-assembled Nanostructures in Thin CIGS Absorber Films for Scalable High-Efficiency PV Modules"

04/30/12 *Invited Speaker:* **2012 Public and Land-Grant University Conference on Energy Challenges: The Next 50 Years.** Panel on Renewable Energy: Solar, Wind and Other Innovations

03/28/12 *Invited Speaker:* **International Green Energy Business Conference Korea 2012 (IGEC 2012), PV Business Insights Symposium,** Daegu, Korea: "HelioVolt and SK Innovation: Accelerating CIGS into PV Markets"

01/12/12 **NSF NNIN Workshop on Materials and Manufacturing for Energy and Electronics (M^2E^2),** Austin, TX: "CIGS PV Device Structure and its Historical Evolution"

06/30/11 *Invited Speaker:* **2011 International Conference on Materials for Advanced Technologies,** Suntech, Singapore: "CIGS Synthesis by Reactive Transfer Processing of Compound Precursors"

05/09/11 **2011 E-MRS/MRS Bilateral Conference on Energy, Symposium R: Advanced inorganic materials and concepts for photovoltaics,** Nice, France: "CIGS Synthesis by Reactive Transfer Processing of Compound Precursors"

03/21/11 *Invited Speaker:* **2011 APS Spring Meeting, Scalable Technologies for Terawatt Photovoltaics,** Dallas, Texas: "Challenges to Scaling CIGS Photovoltaics"

03/04/11 *Invited Speaker:* **JSPS 7th Workshop on the Future Direction of Photovoltaics, Tokyo Institute of Technology,** Tokyo, Japan: "CIGS Synthesis by Reactive Transfer Processing of Compound Precursors"

10/07/10 **2010 MRS Workshop on Thin Film Photovoltaics,** Denver, Colorado: "CIGS Synthesis by Reactive Transfer Processing of Compound Precursors"

05/12/08 *Invited Keynote:* **38th IEEE Photovoltaic Specialists Conference**, San Diego, California: "Entrepreneurship on the Road from Science to Sales"

06/26/06 **Energy Nanotechnology International Conference 2006, Massachusetts Institute of Technology**, Cambridge, Massachusetts: "Nanoscale Composition Fluctuations and Charge Transport in CIGS Photovoltaic Absorbers"

08/20/01 *Invited Speaker:* **11th Workshop on Crystalline Silicon Solar Cell Materials and Processes,** Estes Park, Colorado**:** "Le Châtelier's 'Principle of Moderation' and the self-passivation of extended defects in CIS materials"

06/22/99 **Gordon Research Conference on Thin Films and Crystal Growth Mechanisms,** Plymouth, New Hampshire: poster presentation on migration enhanced epitaxy of non-equilibrium $CuInSe_2$ crystallographic polytypes on GaAs.

09/12/97 *Invited Speaker:* **11th International Conference on Ternary and Multinary Compounds (ICTMC-11),** Salford, England: "Engineered Phase Inhomogeneity for CIS Device Optimization"

07/09/97 **Gordon Research Conference on Thin Films and Crystal Growth Mechanisms,** Plymouth, New Hampshire: poster presentation on migration enhanced epitaxy of $CuInSe_2$ on GaAs.

INVITED LECTURES

07/20/21 **48th IEEE Photovoltaic Specialists Conference, Tutorial PM5:** "Introduction to the Challenges and Opportunities of Thin Film Photovoltaic Manufacturing: Translating Science Into the New Energy Economy"

07/13/15	**International School for Materials for Energy and Sustainability IV (ISMES IV),** Colorado School of Mines, "Materials Challenges for Photovoltaics"
05/24/14	**Brookhaven National Laboratory,** "Application of X-Ray Characterization of *In-Situ* Growth at NSLS-II to Relevant Manufacturing Process Optimization Issues"
04/24/13	**EE379, University of Texas,** "CIGS Intrinsic Defect Thermochemistry: Processing and Semiconductor Device Physics Ramifications"
04/11/13	**Solar Seminar Series, Purdue University,** West Lafayette, Indiana: "High-Rate Processing and Advanced Emitter Structures for CIGS PV Module Manufacturing"
10/12/12	**Materials Science, Engineering, and Commercialization Program, Texas State University,** San Marcos, Texas: "High-Rate Processing and Advanced Emitter Structures for CIGS PV Module Manufacturing"
09/11/12	**Innovation, Growth, and Conflicting National Interests: Analyzing the Evolution of the Global Solar Industry, LBJ School of Public Affairs,** Austin, Texas: "Basics of Solar Power Generation Technologies"
07/20/12	***Ettore Majorana* International School of Solid State Physics, Materials for Renewable Energy,** Erice, Sicily: "Thin Film Photovoltaics: CIGS & CZTS"
10/19/10	**LBJ School of Public Affairs,** Austin, Texas: "Future of Solar PV and Sustainability in the Built Environment"
05/30/10	***Ettore Majorana* International School of Solid State Physics, Materials for Renewable Energy,** Erice, Sicily: "Thin Film Photovoltaics"

U.S. PATENTS (EXCLUDING INTERNATIONAL EXTENSIONS)

12,509,769 B1	Remote Reactant Reservoirs for Codeposition with Variable Melt Area Evaporant Flux Control
12,435,414 B1	Remote Reactant Reservoirs for Codeposition with Variable Melt Area Evaporant Flux Control
12,392,036 B1:	Inline Codeposition Modular Multi-Flux Evaporation Source with Integrated Reactive Vapor Manifold
12,317,634 B1:	Photoelectrochemical process intensification for sustainable photovoltaics manufacturing
8,647,533:	Compositions including controlled segregated phase domain structure with segregated phase domain array
8,084,685:	Apparatus for making controlled segregated phase domain structures
8,034,317:	Assemblies of anisotropic nanoparticles
8,021,641:	Methods of making copper selenium precursor compositions with a targeted copper selenide content and precursor compositions and thin films resulting therefrom
7,939,048:	Assemblies of anisotropic nanoparticles
7,767,904:	Compositions Including Controlled Segregated Phase Domain Structures
7,163,608:	Apparatus for the Synthesis of Layers, Coatings or Films (continuation)]
7,148,123:	Synthesis of Layers, Coatings or Films Using Collection Layer
6,881,647:	Synthesis of layers, coatings or films using templates
6,797,874:	Layers, coatings or films synthesized using precursor layer exerted pressure containment

6,787,012:	Apparatus for the synthesis of layers coatings, or films
6,736,986:	Chemical synthesis of layers, coatings or films using surfactants
6,720,239:	Synthesis of layers, coatings or films using precursor layer exerted pressure containment
6,593,213:	Synthesis of layers coatings, or films using electrostatic fields
6,559,372:	Photovoltaic devices and compositions for use therein
6,500,733:	Synthesis of layers, coatings or films using precursor layer exerted pressure containment
5,261,969:	Monolithic voltage-matched tandem photovoltaic cell and method for making same
5,021,099:	Solar cell interconnection and packaging using tape carrier
4,867,801:	Triple-junction heteroepitaxial AlGa/$CuInSe_2$ tandem solar cell and method of manufacture
4,795,501:	Single crystal, heteroepitaxial, GaAlAs/$CuInSe_2$ tandem solar cell and method of manufacture
4,680,422:	Two-terminal, thin film, tandem solar cells
4,322,571:	Solar cells and methods for manufacture thereof
4,320,250:	Electrodes for concentrator solar cells, and methods for manufacture thereof

RESEARCH CONTRACTS AND GRANTS

05/95-12/98	T.J. Anderson and B.J. Stanbery, "Processing of $CuInSe_2$-Based Solar Cells: Characterization of Deposition Processes in Terms of Chemical Reaction Analyses," University of Florida, Contract Final Technical Report NREL/SR-520-30391. Prepared under NREL subcontract XAF-5-14142-10
05/93-05/94	B.J. Stanbery, "New Plasma Source of Hydrides for Epitaxial Growth," Boeing Defense & Space Group, 1993. NREL subcontract XM–1–19142–8.
05/91-05/93	W.S. Chen, J. M. Stewart, R.A. Mickelsen, W.E. Devaney, and B.J. Stanbery, "Research on Polycrystalline Thin Film $CuGaInSe_2$ Solar Cells," Boeing Defense and Space Group, Contract Final Technical Report NREL/TP-413-5835, September 1993. Prepared under NREL subcontract ZH-1-19019-6.
01/91-04/91	B.J. Stanbery, "Manufacturing Technology Development for $CuInGaSe_2$ Solar Cell Modules," Boeing Aerospace & Electronics, Contract Final Technical Report NREL/TP-214-4604, 1991. Prepared under Solar Energy Research Institute Subcontract XC-1-10057-14.

COMPUTER SKILLS

Operating Systems: Mac OS X, Windows, Linux
Programming Languages: C++, Basic, LabView
Mathematical and Data Analysis: Mathematica, SAS JMP
Information Systems: MS Office 365, MS Teams, MS Project, SharePoint

PERSONAL

U.S. citizen, born in Nacagdoches, Texas to the family of a U.S. Army officer and attended twelve different elementary schools in three countries and seven states. Took all required undergraduate upper-level courses for bachelor's degrees in mathematics, physics, government, psychology, sociology, and economics at UT and UNC. Enjoy hiking, cycling, sailing, swimming, diving, cooking, dining, wine, music, and art. Fond or studying philosophy, astronomy, geology, and human history.

REFERENCES

Available upon request