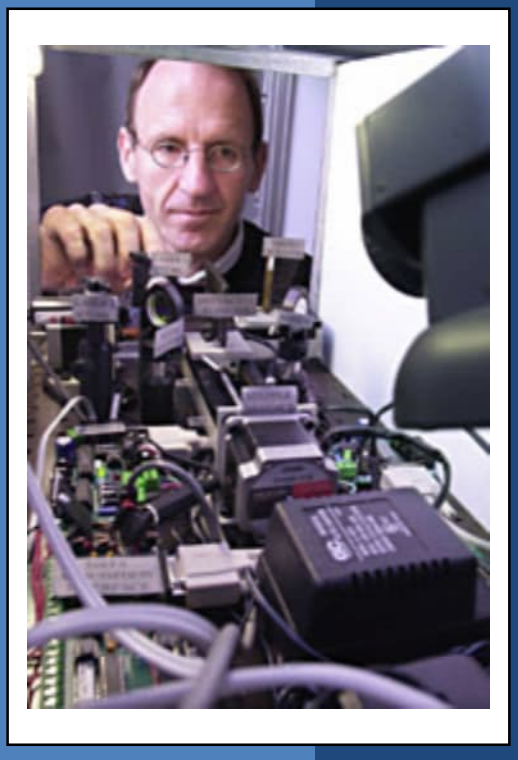
JUNE 2023

Curriculum Vitae

Professor
Lambertus Hesselink, PhD

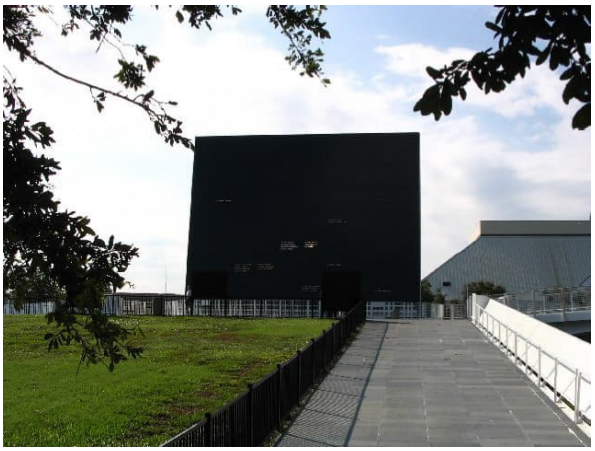




School building project
in rural Nepal, 2004



First Digital Holographic Data Storage System,
Science 1994



Co-designer Astronaut Memorial
"Space Mirror"
Kennedy Space Center, 1991



iLabs
First Internet
controlled optics
lab-in-a-box, 1998



Hubble Space
Telescope Committee

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EXECUTIVE SUMMARY

LAMBERTUS HESSELINK, PhD

Professor
Electrical Engineering, Applied Physics, Aeronautics &Astronautics Depts
Born: Enschede, the Netherlands
Nationality: Dutch
Visa status: Permanent

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Bert@kaos.stanford.edu, lhesse@stanford.edu
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Phone: 650-853-1615

EDUCATION

Ph.D.	1977	California Institute of Technology Applied Mechanics and Physics/Applied Physics, Medical leave from Caltech, June 1974 – February 1975, severe burns over 50% of body Rehabilitation therapy, March 1975-January 1978
Eng.	1974	Twente Institute of Technology,
M.S.	1972	California Institute of Technology
B.S.	1971	Twente Institute of Technology Applied Physics
B.S.	1970	Twente Institute of Technology Mechanical Engineering

Languages: Fluent in English, Dutch, French and German

PROFESSIONAL CAREER

September 1980 - present	Assistant, Associate, and Full Professor of Electrical Engineering and, by courtesy, in the Applied Physics and Aeronautics and Astronautics Departments of Stanford University.
October 1977 - Oct. 1980	Instructor in Applied Physics, Senior Research fellow at Caltech.
March 1995 - April 1997	On leave from Stanford University, Founder, Chairman, CEO, CTO of Siros Technologies, Raised over $50M in financing.
May 1997 - June 2001	Chairman Siros Technologies, Inc.
April 1994 - September 2000	Principal Investigator of DARPA funded $53M Industry Consortium for the development of Digital Holographic Data Storage
October 1999 - 2007	Co-founder, Chairman, Senvid, Inc. Senvid was sold to Western Digital in 2007

PROFESSIONAL HONORS

Significant awards from scientific and professional societies include: Fulbright scholarship, Stheeman Price, Josephine de Karman Fellowship, DARPA award, NSIC award, Fellow of the OSA, Fellow SPIE, AIAA, N. California teacher of the year, Highest ranked teacher at Caltech in 1979, 1980, repeatedly listed on exceptional teaching evaluation list for EE department at Stanford, Five times best paper award from the IEEE, invited member of the Hubble Space Telescope Committee convened by NASA to fix the telescope, Member of the Air Force Scientific Advisory Board reporting directly to the Secretary of the Air Force, invited by Secretary of Air Force to attend and complete course at the Air War College, winner of Progressive Architecture Award and national competition for design of the Astronaut Memorial at Kennedy Space Center, student projects in EE347 won three national optical design competitions, one of top 25 inventors at Stanford University, recipient of the "Best" Award for pioneering contributions to holographic data storage, Member of the Royal Dutch Academy of Arts and Sciences

SCHOLARSHIP

Over 275 keynote and invited presentations at scientific meetings, organizer of over 80 scientific meetings, over 595 papers in scientific journals, over 18 book chapters, editor of Applied Optics, Applied Scientific Research, IEEE Transaction on Visualization, over 100 issued patents and pending patent applications worldwide, visiting Professor Tsinghua University China, Japan, Europe, over 45 Ph.D. graduates. Pioneered next generation optical data storage technology as follow-on to the $20B annual revenue DVD market, now being developed by all major optical storage companies in the world, including Sony, Philips, Matsushita, Pioneer, Samsung, LG, and many others. Pioneered the first Internet controlled laboratory in 1998, which has lead to a worldwide effort on providing on-line teaching laboratories, with over 50 Universities participating in Europe and a similar number in the US. Technology developed for this application is now being commercialized by a start-up company in Silicon Valley. Over 10 million users are projected to be using the technology worldwide in 2010. We pioneered the field of topological matrix and tensor visualization techniques in the middle 1990's, which has lead to a new branch in the IEEE meetings on Digital Image Processing and Graphics, with significant research efforts around the world. As a world-wide leader in three-dimensional imaging and signal processing, we developed and demonstrated the first tomographic imager of gaseous flows and made major contributions to 3-D solid-state up-conversion displays. Most recently we have improved the performance of nano-apertures by inventing a new C-shaped aperture that has over 1 million times power throughput improvement over round or square sub-wavelength apertures, leading to major advances in scanning near-field optical microscopy, optical data storage, biomedical sensing, chemical sensing, opto-electronic on-chip integration. Nano technology researchers around the world are now investigating the use of these apertures for a variety of applications.

EXPERTISE

Consulting to Industry and Government

Ultra-high density optical data storage, optical communication components and optical interconnects, optical information technology, nano-optics, digital image processing, Internet controlled instrumentation (CyberLab), member of several University committees, world renown expert witness in over 15 patent cases, testified to the Israeli Supreme Court for ½ hour, consultant to industry, NSF, member of US Air Force Scientific Advisory Board, Hubble Space Telescope Committee, Astronaut Memorial Co-designer.

Management (While on leave from Stanford)

Developed a personal open management style based on consensus building, collaboration and negotiation.

Started two successful high-tech companies, Siros Technologies and Senvid with financial backing from blue-chip rate VC, private and corporate sources. Managed all aspects of the business, including marketing, finance, technology and business development, product development, operations, human resources.

Devised business strategies and implemented the plans; successfully negotiated, managed and completed a $53 M DARPA contract for the development of the next generation DVD technology; raised an additional $54M in VC funding; managed startup growth from inception to over 67 employees; hired over 100 employees, including top management personnel; negotiated numerous business contracts, including major partnership contracts with multi-national Japanese companies such as TDK, Mitsubishi Chemical, and Olympus, as well as Lucent, EMC, and HP in the US.

Provided leadership to the Board of Directors, including Board members from top tier US VC firms New Enterprise Associates, Chemical Materials Enterprise Associates, Sequel Ventures, Austin Ventures, and multi-national companies including TDK, Lucent, Citicorp, Dow Chemical, HP, and EMC.

Developed patent strategies, carried out patent valuations for Siros technology, negotiated licensing agreements, and developed revenue models associated with these licensing efforts. Sold large patent portfolio to multi-national company.

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Developed optical storage products, including novel read-write optical drives and media, holographic data storage devices, and volumetric optical drives. Took technology development effort to the prototype level.

Appeared in feature articles of Forbes and Red Haring magazines, and Senvid was selected by Venture One as one the 60 most promising angel funded companies in the US in 2000.

Initiated, Managed and executed sale of Senvid to Western Digital.

ACADEMIC CREDENTIALS

ACADEMIC HISTORY

Ph.D.	1977	California Institute of Technology Applied Mechanics and Physics/Applied Physics	
Medical leave from Caltech		Jun '74 – Feb '75	Severe burns over 50% of body
Rehabilitation therapy		Mar '75-Jan' 78	
Eng.	1974	Twente Institute of Technology Applied Mechanics	
M.S.	1972	California Institute of Technology Mechanical Engineering	
B.S.	1971	Twente Institute of Technology Applied Physics	
B.S.	1970	Twente Institute of Technology Mechanical Engineering	

SCHOLARSHIPS AND ACADEMIC HONORS

1970	The Stheeman Prize for best academic performance, Twente Institute of Technology
1971—1974	Fulbright Scholar, recipient of IIE award and Dutch Government Fellowship award for studies abroad
1974—1975	Josephine de Karman Fellowship
1979, 1980	Triple star, *** Highest Teaching Rating at Caltech
1983	Award: Engineer of the Year 1982 AIAA Northern California chapter
1985	Award: Co-recipient of the Itek award for the paper Holographic Reciprocity Law Failure", Appl. Opt. 23, 1984 issued by the Society of Photographic Scientists and Engineers
1985	Elected to Who's Who in Optical Science and Engineering
1986	Elected to Who's Who in California
1987	Elected to Who's Who in the West

1987	Elected to Personalities of the Americas
1987	Invited Visiting Professor at Tsinghua University, Beijing
1988	International Leaders of Achievement award
1988	Elected to Men of Achievement
1988	Elected to Who's Who of Emerging Leaders in America
1988	Elected to Five Thousand Personalities of the World
1988	Selected to be a member of the design team for the Astronaut Memorial in Orlando, Florida, after winning an international design competition
1989	Elected to American Men and Women of Science
1989	Recipient of the Progressive Architecture Award for the Astronaut Memorial
1989	Elected to International Directory of Distinguished Leadership
1989	Elected to Who's Who in the West
1990	Elected Fellow, Optical Society of America
1990	Elected invited Member of Image Processing Ad Hoc Committee to solve the Hubble Space Telescope problem
1990	Award: Recipient of the "Best Paper for the IEEE Visualization '90 Conference", Automated Topological Analysis of Fluid of Vector Sets, Helman, J.; Hesselink, L.
1991	Elected to Who's Who in Science and Engineering
1992	Award: Recipient of "Outstanding Paper for 1991 Award" for the Computer Society of the IEEE, "Automated Topological Analysis of Fluid Flows of Vector Sets, Helman, J.; Hesselink, L.
1992	Award: Recipient of the "Best Paper for the IEEE Visualization '91 Conference Award", Visualization of Second Order Tensor Fields and Matrix Data, Delmarcelle, T.; Hesselink, L.
1994-95	Elected to Who's Who Registry of Business Leaders
1994	Award: Recipient of "Best Paper Award from the IEEE Computer Graphics and Applications Society for 1993 for the the paper: "Visualizing second order tensor fields with hyperstreamlines," by Thierry Delmarcelle and Lambertus Hesselink; award presented at Vis '94 conference in Washington DC, October 1994.
1994	Award: Best conference paper for Visualization '94: "The topology of symmetric second-order tensor fields," by Thierry Delmarcelle and Lambertus Hesselink, presented in Washington DC, October 1994.
1994	Award: Director's Award for Significant Technical Achievement (First Fully Automated Digital Holographic Data Storage System-HDSS), presented at 17th Systems and Technology Symposium San Francisco, CA, October 25, 1994, by Department of Defense - ARPA (Advanced Research Projects Agency).
1994	Selected by the Secretary of the Airforce to be a member of the Air War College, and completed summer course in preparation for civilian Air Force leadership role

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1995-98	Elected Member of the Scientific Advisory Board of the United States Air Force reporting directly to the Secretary of the Airforce
1996	Elected to the Royal Dutch Academy of Arts and Sciences, April 1996.
1999	Award: National Storage Industry Leadership Award for 1999: "For exceptional vision and leadership of the NSIC HDSS and PRISM programs to establish proof of concept and develop the infrastructure for Holographic Data Storage"
1999	Recipient National Instruments Prize for Innovations in Education for developing the first Internet controlled laboratory
2000-2002	Elected to Who's Who in Executive and Professionals
2003-2004	Elected to America's Registry of Outstanding Professionals
2003-2005	Elected Fellow of SPIE, February 2004
2004-2005	Selected in Who'sWho in America, Who'sWho in Science and Engineering,
2005	Selected in Who'sWho in the West, Who'sWho in Finance and Business, Who'sWho in American Education, and Who'sWho in Executives & Professionals
2007	Best Award, for pioneering contributions to holographic data storage
2011	Top 1% of US inventors, with over 100 patents worldwide, many licensed
2011	Distinguished member of International Advisory Board, Yonsei University, Korea , 5 year appointment 2011-2016
2012	NSF selection as being in top 1% of all US inventors, with over 100 patents in US and worldwide, some of which used by millions of people each day
2013	Who is Who in America, Who is Who in the world, Who is Who business leaders, and related.
2013	NSF selection as being in top 1% of all US inventors, with over 100 patents in US and worldwide, some of which used by millions of people each day
2017	IEEE SciVis Test of Time Award 1990-92 based on paper:Visualization of Second Order Tensor Fields and Matrix Data, Delmarcelle, T and Hesselink, L., IEEE Vis'92 issued Aug 2017
2022	Iela (The International E-Learning Association) *Gold Award*, E-Learning Experience (https://www.ielassoc.org/past-winners)
2022	*Best Student Presentation Award* at EIPBN (The 65th International Conference on Electron, Ion and Photon Beam Technology and Nanofabrication) New Orleans, LA, May 31-Jun 3, 2022

PROFESSIONAL ACTIVITIES

1980-1988	Consultant to Hughes Aircraft Corporation, Microelectronics Corporation, Visulux Corporation, National Science Foundation, VSL Corporation, Physical Optics Corporation, Northrup and the Air Force

1984	Invited lecturer in lecture series on Digital and Optical Image Processing at the Von Karman Institute, Brussels, Belgium
1986	Invited lecturer in lecture series on Digital and Optical Image Processing at the Von Karman Institute, Brussels, Belgium
1981-1988	Presentation of short courses on holography and digital image processing in the Netherlands, Germany, China, Israel, England, Italy
1987	Invited Visiting Professor at Tsinghua University in Beijing, China
1987-1990	Member of advisory panel to the National Science Foundation
1988	Invited lecturer on Dynamic Optical Interconnects at the International School of Quantum Electronics, Erice, Italy
1988-1989	Member of the design team for the Astronaut Memorial in Orlando, Florida
1988-1990	Member of the Scientific Advisory Board to the Division of New and Emerging Technologies, the National Science Foundation
1994	Member of Editorial Board of the IEEE Transactions on Visualization and Computer Graphics (TVCG).
1995-98	Member of the Scientific Advisory Board of the United States Air Force reporting to the Secretary of the Airforce
1995-2000	Principal Investigator of a $53M DARPA program on Holographic optical data storage, involving four Universities and five major industrial partners, including IBM, Kodak, GTE, Rockwell International and Texas Instruments. Directed a group of 136 scientists and engineers which resulted in a demonstration platform that still has the best performance of any data storage system today.
2022	Organizer of CE-10, a Conference by invitation only on reaching pathways to reduce global warming gasses by 50% by 2030. Included open sessions with worldwide audience, and a closed Workshop. Invitees included key decisions makers at organizations and companies in the US as part of the energy ecosystem. Participants included CEOs from utilities, major corporations, auto industry, national Labs, Universities, and Government Energy Agencies.

EMPLOYMENT RECORD

1978-1979	Member of the technical staff for Space and Communications Group, Hughes Aircraft Company.
1977-1978	Research Fellow in Fluid Mechanics, Graduate Aeronautical Laboratories, California Institute of Technology.
1978-1979	Instructor in Applied Physics in charge of APh 153 abc and Research Fellow in Fluid Mechanics at Caltech.
1979-1980	Senior Research Fellow in Fluid Mechanics and Instructor in Applied Physics at Caltech. In charge of the graduate course Modern Optics, APh 153 abc.

1981-1985	Assistant, Professor in Aeronautics and Astronautics and Electrical Engineering, and by courtesy in Applied Physics.
1983-present	Legal technology expert consultant in over 15 patent major suits, including a 30 minute presentation to and cross-examination by the Israeli Supreme Court
1985-1990	Associate Professor of Electrical Engineering and, by courtesy, in the Applied Physics and Aeronautics and Astronautics Departments of Stanford University.
1990-present	Professor (with tenure) in the Electrical Engineering and the Aeronautics and Astronautics Departments at Stanford University (joint appointment)
1995-1996	Founder, CEO, Chairman, and CTO of Siros Technologies, Inc., San Jose, California. (on sabbatical leave).
1996-2000	Chairman Siros Technologies
2000-2007	Chairman and Co-founder of Senvid, Inc.
2002-2003	Chairman and CEO Senvid Inc.
2002-2003	Member of the Board, Co-founder MultiDigit Corp.

EDITOR

Proceedings of the 26th International SPIE Conference, section on 3-D Processing and Display of Data, 1982
Associate Editor for Journal of Applied Scientific Research, 1987-1996
Topical Editor for Applied Optics, Optical Society of America, 1989-1994
Topical Editor for Applied Sciences, 1989-1998
Associate Editor for Applied Optics, January 1990-1994
IEEE TVCG Editorial Board, Washington, DC, October 18, 1994.
Associate Editor of IEEE Transactions on Visualization and Computer Graphics, 1995
Guest Editor SIAM, special issue on Optical Data Storage
Editor Materials Research Society, Symposium Proceeding Series, 2001.
Editor Proceedings of IASTED, 2001
Editor Proceedings IASTED, 2002
Editor on Materials Research Society, Symposium Proceedings for 2003
Editor Volume 803, MRS Advanced Data Storage Material and Characterization Techniques, 2004
Editor, L. Hesselink, Proceedings of the Optical Data Storage Meeting 2010, SPIE, May 2010
Editor, ODS 2012, Annual Meeting Tucson AR

MEMBERSHIPS IN PROFESSIONAL SOCIETIES

Sigma Xi
APS, American Physical Society
OSA, Fellow Optical Society of America
SPIE, Fellow of the International Society for Optical Engineering
AIAA, American Institute for Aeronautics and Astronautics
Member of the Royal Dutch Academy of Arts and Sciences

MEETING ORGANIZER (PARTIAL LIST)

1. Meeting organizer and co-chairman of the Twenty-Sixth International SPIE Meeting in San Diego, section on "3-D Processing and Display of Data", San Diego, CA, August 26—27, 1982.
2. Organizer of topical meeting on "Holography", OSA, Honolulu, HI, April 1986.
3. Member of the local organizing committee of the Annual Meeting of the Optical Society of America, Santa Clara, CA, October 1988.
4. Organizer of meeting on "Visualization of Scientific Data", SPIE, January 1989.
5. Organizer of meeting on "Practical Holography", SPIE, January 1989/1990/1991/1992
6. Symposium Organizer on "Optical Interconnections for Computers", OSA Annual Meeting, Orlando, FL, October 15—20, 1989.
7. Organizer of session for "Experimental Techniques", APS 42nd Annual Meeting, Palo Alto, CA, November 19—21, 1989.
8. Chairperson for "Imaging", SPIE Conference, Los Angeles, CA, January 14—19, 1990.
9. Member of "Visualization" Panel, "Extracting Meaning from Complex Data" Conference,SPIE/SPSE
10. Symposium on Electronic Imaging, Santa Clara, CA, February 12—16, 1990.
11. Organizer for NASA Scientific Visualization Workshop, Stanford University, Stanford, CA, June 11—13, 1990.
12. Chairperson for "3-D Visualization of Scientific Data", SPIE Conference, San Diego, CA, July 9—13, 1990.
13. Member of organizing committee on "Optical Computing" in Salt Lake City, Utah, March 4-6, 1991.
14. Organizer for NASA Scientific Visualization Workshop, Stanford University, Stanford, CA June 11-13, 1990.
15. Chairperson for "3-D Visualization of Scientific Data", SPIE Conference, San Diego, CA July 9-13, 1990.
16. Member of organizing committee on "Optical Computing" in Salt Lake City, Utah, March 4-6, 1991.
17. Member of the Technical Committee of the IEEE Visualization '90, '91, '92 Annual Meetings
18. Member of the Committee on Engineering in Biology and Medicine, 1993.
19. Member of the Program Committee, Sixth Eurographics Workshop on Visualization in Scientific Computing, Porto Conte, Italy, May 1995.
20. Co-Chairperson for Photonics West '95, Practical Holography IX, San Jose, CA, February 1995.
21. Chairperson (Tutorial) CLEO/QELS '95, Baltimore, MD, May 1995.
22. Member of Organizing Committee, Symposium on Data Storage: 1996 Annual Meeting of the Optical Society of America, October 20-15, 1996, Rochester, New York.
23. Chairperson IEEE/LEOS, Lasers and Electro-Optics Society, November 1995.
24. Member of organizing program committee, IS&T SPIE, Symposium on Electronic Imaging and Technology-Photonics West '96, San Jose, CA, January 1996.
25. Program Committee Chair, OSA Topical Meet, "Holography,": Boston, MA, April 1996.
26. Member of Program Committee, International Symposium on Holographic Memories '96, May 1996.
27. Member organizing committee, ICO XVII '96 Optics for Science and New Technology, Taejon, Korea, August 1996.
28. Presiding Chair, OSA Annual Meeting, ILS, XCII Optics & Imaging Center, Rochester, NY, October 1996.
29. Member of Program Committee, IEEE Visualizaiton '96, San Francisco, CA, October 1996.
30. Program Committee Chair, Photonics West '97, San Jose, CA, February 1997.
31. Program Committee Chair, Photonics West '98, San Jose, CA, January 1998.
32. Program Committee Chair, Photonics West '99, San Jose, CA, January 1999.
33. Program Committee Chair, Photonics West '00, San Jose, CA, January 2000.
34. International Workshop on Holographic Data Storage, Stanford Organizer, Nice, France, March 8-11, 1999.
35. Member of the Organizing Committee, IEEE '01, Symposium on Parallel and Large Data Visualization & Graphics, San Diego, CA October 2001.
36. Conference Chair, IASTED '00-'03 Technical Committee on Telecommunications, Banff, Canada, July 2002.
37. Program Organizer, SPRC Annual Meeting, "Nanophotonics," Stanford Campus, September 2002, 2003.
38. Co-organizer OSA Topical Meeting, Optical Data Storage Conference, May 2003, Vancouver, Canada.
39. Meeting Organizer, CLEO Europe EQEC 2003, Symposium on Optical Storage, Munich, Germany, June 2003.
40. Conference Chair, IASTED WOC 2003, Wireless and Optical Communications Conference, July 2003, Banff, Alberta, Canada.
41. Moderator and Panel Organizer, Stanford Nanophotonics Workshop, January 24, 2004.
42. Program Committee Member of the 2nd IASTED International Conference on Communication and Computer Networks (CCN 2004), Cambridge, MA, November 2004.
43. Program Committee Member of the IASTED International Conference on Communications, Internet and Information Technology (CIIT2004), St. Thomas, Virgin Islands, November 2004.

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44. Chair OSA bi-annual meeting on photorefractives, PR'07
45. Chairman of the International ISOM/ODS 2011 OSA meeting, Hawaii, 2011
46. Founder and Sponsor of the Leen van Wijngaarden Prize Foundation, 2011
47. Chairman of the Leen van Wijngaarden Prize selection committee, 2011 till present
48. Ambassador of the Twente University, 2011 till present
49. Co-Founder of the Secure Content Storage Association, 2011
50. Distinguished member of International Advisory Board, Yonsei University, Korea , 5 year appointment 2011-2016
51. Advisor to the Dutch Government on energy issues, 2011 till present
52. 3D Editorial Board Member, 3DMR, Korea, 2011 till present
53. Member of the International Advisory Board, CC3DMR Korea, 2011 till present
54. Co-Founder and Founding Chairman of the "Secure Content Storage Association", a LLC formed between Warner Bros, Fox, Western Digital and Sandisk to develop the next generation of content storage platform for Premium Content (Follower to BluRay technology) , 2012
55. Chairman of the ODS 2012 meeting in Tucson Arizona, 2012
56. Ambassador of Twente University, 2012
57. Consultant to industry, 2012 till present
58. Editor Journal of 3-D imaging, 2012 till present
59. Member of the OSA Awards Committee, 2012 -2015
60. NSF Proposal Review committee, Expert witness in data storage and asbestos litigation, 2012 till present
61. Founding Chairman of the Secure Content Storage Association (SCSA) consisting of Warner Bros, Fox, WDC, Sandisk, Samsung, LG, Seagate, 2013
62. Ambassador of the University of Twente, 2013
63. Board member of Yonsei University Advisory Board, Korea, 2013
64. Editor Journal of 3-D Imaging, 2013
65. Member of OSA Leith Awards committee, 2013
66. Member of the Editorial Advisory Board of Optical Data Storage and Processing, 2013
67. Expert witness in major cases involving optical data storage and asbestos litigation, 2013

SIGNIFICANT RESEARCH AND PROFESSIONAL ACCOMPLISHMENTS

A. LASER-MATTER INTERACTION:

1. Laser propagation though a random medium. 1973-1980

At Caltech, in the 1970's I designed, built and conducted a very powerful experimental apparatus for studying the propagation of nonlinear acoustic and optical waves through a random medium. This study became a benchmark research effort, and still stands as the most comprehensive experimental and theoretical study in this area. The results of this study were disseminated worldwide at scientific meetings through over 16 invited lectures.

2. Femto second and nano second laser-matter interaction 1990-2005

In the early 1990's we designed, built and tested a novel pulse laser deposition system with unique optical diagnostics and controls in place that allowed us to study the interaction between nano-second and femto-second pulses and a variety of materials. We studied ablation of photorefractive media, and more recently silicon. We developed a new theoretical framework for understanding laser material removal at the femto and nano second time regimes. This work has gained significant interest in both the scientific community and industry as laser ablation in silicon is now used to machine intricate patterns in integrated circuit boards, and inkjet nozzles among other applications.

B. THREE-DIMENSIONAL IMAGING, ANALYSIS, STORAGE AND DISPLAYS

1. Three-dimensional flow visualization. 1981-2000

We developed the first numerical and experimental holographic analysis tools for understanding complex fluid flows and chemical reactions. We were the first to build a holographic display of a mixing jet and used these new tomographic imaging diagnostics techniques to investigate fluid flow behavior that lead to much improved understanding of fluid flows computed by numerical techniques.

2. Three-dimensional medical displays 1981- 1998

In the early 1980's we developed new holographic display techniques for visualization of medical data, such as NMR and CAT scans in conjunction with the medical school at Stanford University and Professors Goodman and Macovski. This work ultimately led to the first all-solid state three-dimensional display that uses up conversion rare-earth doped glasses. Currently this work still stands as the premier effort in solid state volumetric displays. We developed extensive new materials and system concepts in conjunction to address the complete system.

3. Topological visualization of vector and tensor data sets 1985-2008

In 1985 we published the first paper on using mathematical topology to analyze and display complex vector and tensor data sets. This work has pioneered a new area in research in the visualization community and graphics community worldwide. The IEEE now has an annual meeting in which vector and tensor field topology takes on a prominent role. Our pioneering first papers, which have won several awards from the IEEE are still the benchmarks by which all current topological papers are compared.

4. Holographic and optical data storage 1985-2008

In 1985 we started pioneering work on holographic data storage to develop the next generation optical data storage technology, which is now a $20B industry. We have lead the word in fundamental material science and optical systems technology that has lead to the worlds highest performance storage system in 2000, when we demonstrated over 16 Gbit/sec data transfer rate and storage capacities of 100's of GB on a CD disk. Worldwide all major storage companies are now working on holographic data storage systems as the next generation optical storage technology. Our group is recognized around the world as the pioneering leader in this area. We have presented our work in over 100 invited papers and keynote talks at all major optical and magnetic storage meetings worldwide. The $53 M DARPA HDSS and PRISM programs, founded and lead by me are still considered the best research effort in this area, worldwide and have formed the basis for smaller follow-on efforts around the world by every major optical storage system manufacturer, including Sony, Philips, Matsushita, Pioneer, Samsung, LG, and many others.

C. FUNDAMENTAL MATERIALS SCIENCE FOR USE IN OPTICAL SYSTEMS

1. Photorefractive physics and material science for optical interconnects and storage 1981-2004

In the early 1980's Professor Goodman and myself developed the first optical interconnects based on holographic and photorefractive materials for dynamic operation. This work lead to a worldwide effort in using optics for optical interconnects in electronic circuits, and has resulted in applications ranging from back-planes in computers to local area networks using holographic switches and connectors. We started and lead the way to using photorefractive materials for dynamic interconnects, by developing new and improved materials as well as new architectures for optical interconnects in free spaced, on planes and in volumes. In the middle 1980's we expanded this work to include holographic data storage using photorefractive and photopolymer media. We developed new fiber based photorefractive media for displays and storage, and we have grown extensive new crystals using dopants optimized for new functionality. For example, we developed LiNbO3 media doped with rare-earth elements to achieve the first optically gated long-term storage in LiNbO3 with an efficiency similar to that of LiNbO3 doped with Fe. This lead to new long term storage capabilities of photorefractive media, and this work has been the leading example for

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new follow-on efforts worldwide. This work lead to my inclusion in the list of 40 top Dutch material Scientists of the last century.

2. Glass and polymer media for storage and display 1981-2004

Our research has been characterized by using an approach of addressing total system issues, including both materials and components needed to develop new systems having revolutionary new performance. To this end we have built a unique pulsed laser deposition system combined with MBE capabilities for making glass waveguides and thin film structures. We also built extensive crystal growth facilities for growing all types of photorefractive crystals and fibers. These facilities allowed us to grow many crystals with much improved performance for optical processing and data storage, including LiNbO3 doped with different dopants for long term storage, fast processing and electrically gated diffraction. These media lead to new developments in optical communications and processing. We also developed new glass media by doping glass hosts with numerous rare earth dopants for the first three-dimensional all solid state display.

To augment the materials efforts we carried out extensive modeling of materials growth processing as well as the physical performance and response of these media to laser irradiation of femto, pico, nano and msec pulses.

D. NANO APERTURES AND SENSORS USING SURFACE PLASMON RESONANCES

1. Ten million times improved performance C-shaped nano apertures 2000-2008

In the late 1990's we discovered a new shaped nano aperture that has remarkable performance compared with conventional round and square sub-wavelength apertures, solving a long-standing severe problem with nano-imaging. By morphing a rectangular aperture into that of a letter C-shape, the optical power throughput increases by a factor of over one million at the same near field optical spot size. These apertures allow NSOM systems to be much improved in terms of scanning speed and performance and makes it feasible to store over 1 TB of data on an optical disk. C-shaped apertures are now investigated worldwide for application in optically assisted magnetic recording, bio sensing, optical storage and NSOM applications, among others. The core of our work is to to emphasize the fundamental optical and physical processes involved in the generation of these nano-sized spots and using this understanding to develop new systems and physical applications. This work has lead to over 25 invited talks and key note addresses worldwide, and a number of patents, with researchers worldwide following up on our research.

2. 1000x times improved Goos-Hanchen surface plasmon resonance bio sensors 2002-2008

Surface plasmon resonance (SPR) sensors are widely used in bio engineering and science research for detecting species interactions and properties. These sensors rely on reflectivity properties of an optical beam near incident at near the total internal reflection angle. We discovered that by using the Goos-Hanchen effect we could improve the sensitivity of these sensors by two to three orders of magnitude. This increase in sensitivity now allows measurement of single molecule interactions that have the potential to open up whole new areas of biological research. We are working with Professor M. Davis in the School of Medicine to explore the use of ghSPR sensors for research on protein-protein interactions for immune system response. GE, having bought Biocor, among many others is now starting a new program on ghSPR sensing in conjunction with our lab.

3. Finite Difference Time Domain calculations of nano structures

We have developed and extensively tested a robust modeling program for calculating nano-sized optical structures. This program has allowed us to design, test and build novel optical apertures and structures having orders of magnitude performance improvements over previous apertures. This program is also combined with our previous work on topology to provide us with unique and very significant tool for obtaining insight into the physics of how nano structures work. This has lead to the innovations described above.

E. INTERNET ASSISTED LABORATORIES, ILABS 1995-2005

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In 1998 we pioneered the first internet assisted laboratory, Cyberlab. We demonstrated for the first time that the internet could be used to remotely access and control an optics experiment. We built a complete stand-alone system by adopting existing internet technologies and by inventing a new architectural approach that makes it possible to allow multiple users to seamlessly interact and carry out remote experiments as if they were physically present in the same laboratory. We invented new electronic notebooks, and control mechanisms that were needed for reliable control of instruments over a best-effort internet communication system. This work has received several prices and we have presented keynote lectures and over 50 invited talks worldwide on this topic since then. Our work has stimulated worldwide interest in iLabs and in Europe and the US several consortia have been formed involving over 50 universities to further develop this technology and test its pedagogical value for education and training. New internet technology developed during this project has formed the foundation of a startup company that is leading the way in novel remote access and sharing applications for individuals and small busnesses.

F. LEGAL EXPERTISE 1983-2008

Over the years I have gained a reputation as a worldwide recognized expert on optics and holography. I have been an expert witness in over 15 major case and I have never lost a case. This includes expert witness services to multi-national corporations including Sony, Philips, Hughes Aircraft, and Dolby, as well as smaller firms. I was presented with an unusual invitation to argue the case from a technical perspective for the Israeli Supreme Court for 30 minutes. I was a key member of several teams which were awarded multi-million-dollar damages awards.

I have also extensive experience in contract law. I have defined and negotiated multi-million-dollar research agreements with major companies including TDK, Olympus, Mitsubishi Chemical, IBM, Kodak, Rockwell International. I single handedly negotiated and completed the Intellectual Property rights agreement and the research contract among twelve research partners in two $53M DARPA programs.

As an inventor of over 60 patents and 34 more pending applications, I have gained significant patent law experience, in both prosecution, litigation and licensing. I have managed several large patent portfolios and I have successfully licensed patents to major corporations.

G. MANAGEMENT EXPERIENCE AND FUND RAISING

As founding Principal Investigator of two large $53M DARPA programs, I managed and lead a research team over 130 scientists and engineers. As PI I was responsible for all financial and technical reporting, as well as all interfaces with the Government. This program was very successful and stimulated companies and universities worldwide to continue research on holographic data storage, leading to the first commercial holographic data storage system prototype in 2005. Holographic data storage is now considered one of the prime candidates as follow-on technology for DVD storage. The impact of our work on the $20B optical storage industry has been profound and recognized around the world.

H. START-UP COMPANIES FOUNDED (WHILE ON LEAVE FROM STANFORD)

Started two high-tech companies with backing from blue chip VC, private and corporate sources. Developed and assisted in all aspects of the business, including marketing, finance, technology development, product development, operations, HR and business development. Raised over $50M in VC funding, grew Siros to over 67 people, and hired over 100 employees, including top management personnel. Negotiated numerous business contracts, including major partnership contracts with Japanese industries such as TDK, Mitsubishi Chemical, and Olympus, as well as Lucent, EMC, and HP in the US.

Developed new technology in the data storage area, from the inception to complete prototype development, testing and preliminary manufacturing, as CTO at Siros.

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Developed patent strategies, carried out patent valuations of Siros technology, negotiated licensing agreements, and developed revenue models associated with these licensing efforts, after Siros was sold.

Appeared in feature articles of Forbes and Red Haring magazines, and Siros was selected as one the ten top companies to watch.

Senvid is a spin-off company based on the iLabs technology and provides Personal Private Networks to individuals and small and medium businesses. Senvid's unique patented peer-to-peer secure technology will be widely used around the world by over 10 million users in 2008. Senvid was bought by Western Digital in 2007.

I.SIGNIFICANT GOVERNMENT CONSULTING

I have been a member of several NSF advisory Boards, advising the government on research policies as well as issues related to gender in science and engineering.

I was invited by Dr Sheila Widnall to become her personal invitee to the **Air War College**, as a prerequisite for membership in the **Air Force Scientific Advisory Board**. I reported directly to the Secretary of the Airforce on issues related to technology and systems for future warfare.

When the **Hubble space telescope** failed shortly after launch, I was invited by NASA together with a handful of other top scientists and engineers in the country to form a committee to investigate the cause of the failure, and to recommend solutions to the problem. Our committee ultimately diagnosed the problem correctly and proposed a corrective solution. This correction was successfully implemented making the Hubble space telescope perform beyond the original specifications.

Together with the architect firm of Wes Jones we won a nation-wide competition to design the **Astronaut Memorial** to honor the astronauts fallen in the US space program. We designed, built and delivered on time the Astronaut Memorial at the Kennedy Space Center, which was inaugurated by Vice President Quale of the first George Bush administration in 1991.

J. NOVEL DIFFERENTIAL PHASE CONTRAST 3-D X-RAY IMAGING

2012-present

We are developing a novel method for aviation security with applications in medicine, biology, and industrial inspection among others. Differential phase contrast (DPC) imaging holds premise for measuring the index of refraction of liquids using partially coherent X-ray sources. This technique has been developed for medical applications but has very limited field of view (FoV), is not very efficient in the use of X-ray photons with losses over 75% due to the use of gratings required for DPC. We have developed a new X-ray source producing partially coherent X-rays up to 220KeV, and a mating detector that allows us to increase the FoV by an order of magnitude, increase X-ray throughput by over 4x and reduce the time and complexity for making DPC measurements. The heart of the newly developed technology is a photo-electron source that allows the generation of partially coherent X-rays from ~500fsec to CW.

We are investigating the underlying fundamental physical phenomena; the application of novel modeling techniques and we are pioneering a novel way in which DPC measurements can be obtained. At the same time, we are working with industrial partners to transfer the technology developed in our laboratory into the market place.

K. NANO OPTICAL CONVEYOR BELT

2011-present

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We have developed a novel way in which nano particles can be trapped using C-apertures invented in our laboratory in 2000. We invented, and then built and tested a Nano Optical Conveyor Belt (NOCB) that is capable of trapping and then transporting nano sized particles in a 2-D plane. This fundamental technology allows us to build novel devices for sorting, for example DNA, proteins, nano particles for bio applications, for creating 3-D nano materials, and for stimulation of neuron activity in living organisms, among other applications. This is to our knowledge the first time that nano particles have been trapped and then transported in a controlled manner. The NOCB platform technology has the potential to become a cornerstone of the lab on a chip.

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44. Hesselink, L., "Holographic Data Storage using Photorefractives," Snowbird, Physics of Quantum Electronics, Salt Lake City, UT, Jan 7-10, 1993.

45. Hesselink, L., "Holographic Data Storage Systems Implemented with Photorefractive Materials, "Research Trends in Nonlinear and Quantum Optics, La Jolla, CA November 21-23, 1993.

46. Hesselink, L., "Holographic Data Storage Systems Implemented with Photorefractive Materials," Leos '93 Annual Meeting, November 18, 1993.

47. Hesselink, L., "Holographic Data Storage," Optical Society of America, Toronto, Canada, October 3-8, 1993.

48. Hesselink, L., "Visualization and Feature Extraction of Tensor Datasets," U.S. National Congress on Computational Mechanics, Washington, D.C., Aug 16-18, 1993.

49. Hesselink, L., "Holographic Data Storage Systems," Ukranian Academy of Sciences - Fourth Topical Conference on Photorefractive Materials, Effects and Devices, Kiev, August 11-14, 1993.

50. Hesselink, L., "Holographic Data Storage Implemented with Photorefractives," Intermag '93 - International Magnetism, Stockholm, April 13-16, 1993.

51. Delmarcelle, T.; Hesselink, L.; "Visualizing Second-Order Tensor Fields with Hyperstreamlines," IEEE Computer Graphics and Applications, vol. 13, no. 4, pp. 25-33, 1993 (special issue on scientific visualization).

52. Ning, Paul; Hesselink, L.; "Fast Volume Rendering of Compressed Data," Proceedings-IEEE Visualization 1993, pages 11-18.

53. Hesselink, L., Bashaw, M. C. and Heanue, J.; "Holographic Data Systems," Russian Academy of Sciences, Optical Memory & Neural Networks Conference, August 23-30, 1994, Moscow, Russia.

54. Hesselink, L., "Visualization of Vector and Tensor Datasets," ICASE Nasa-Langley, Hampton, VA, August 8-9, 1994.

55. Hesselink, Lambertus, "Materials for Holographic Data Storage," OSA Annual Meeting, Dallas, TX, October 1994.

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56. Hesselink, Lambertus, "Holographic Data Storage." (lecture) NASA-Goddard, Washington, DC, October 1994.

57. Hesselink, L., Heanue, J.F., and Bashaw, M.C., "A digital holographic data storage system," 1994 Japan-U.S. Workshop on Functional Fronts in Advanced Ceramics (Boundaries and Defects), sponsored by the Science and Technology Agency (Japan) and the National Institute for Research in Inorganic Materials (Japan), Tsukuba, Japan, December 6-8, 1994, Paper PL4.

58. Bashaw, M.C., Heanue, J.F., and Hesselink, L., "Photorefractive Material Requirements for Holographic Data Storage," 1994 Japan-U.S. Workshop on Functional Fronts in Advanced Ceramics (Boundaries and Defects), sponsored by the Science and Technology Agency (Japan) and the National Institute for Research in Inorganic Materials (Japan), Tsukuba, Japan, December 6-8, 1994, Paper 5B1.

59. Bashaw, M.C., Heanue, J.F., and Hesselink, L., "Critical issues in volume holographic data storage," Fourth Meeting of the Topical Group on Phase Conjugation and Wave Mixing, Optical Society of Japan, Kobe, Japan, December 9, 1994.

60. Hesselink, L., "Application of Data Compression to 3-D Scalar field Visualization" and "Visualization of Vector and Tensor Datasets," Institute of Italian National Research Council, Workshop: Multidimensional Fields, Rome, Italy, July 6-9, 1994.

61. Hesselink, L., "Visualization of Tensor and Data Sensor," International Conference and Research Center for Computer Science in Schloss Dagstuhl, Germany, May 23-27, 1994.

62. Hesselink, L. and Uhrich, C.; "Submicron Defect in Periodic Structures Using Photorefractive Holography," Optical Meeting - Frontiers in Information Optics, Kyoto, Japan, April 4-13, 1994.

63. Hesselink, L., "Materials for Holographic Storage," Raychem, distinguished visitors lecture series, March 30, 1994.

64. Hesselink, L., "Practical Holography," IS&T/SPIE, San Jose, CA, February 7, 1994.

65. Hesselink, L., "Recent Advances in Materials for Optical Data Storage," OE/LASE '94, Los Angeles, CA January 26-28, 1994.

66. Hesselink, Lambertus, "Storage & Retrieval of Digital Data in a Volume Holographic Medium," Varian, Palo Alto, CA January 1995.

67. Hesselink, Lambertus, "Critical Issues for Digital Volume Holographic Storage," IS&T/SPIE Photonics West '95, San Jose, CA, February 1995.

68. Hesselink, Lambertus, "Holographic Storage & Retrieval of Digital Data," OSA, Salt Lake City, UT, March 1995.

69. Hesselink, Lambertus, "Holographic Storage Materials & Systems," American Physical Society, San Jose, CA, March 1995.

70. Heanue, J. F., Bashaw, M.C., and Hesselink, L., "Volume holographic storage and retrieval of digital information," presented at the Conference on Lasers and Electro-Optics, Baltimore, May 22-26, 1995, Paper CMF5.

71. Hesselink, Lambertus, "Materials for Digital Holographic Data Storage," Second Mediterranean School & Topical Meeting, Cetraro, Italy, May 1995.

72. Hesselink, Lambertus, "Holographic Data Storage Systems and Photorefractive Materials," OSA Topical Meet, Photorefractive Materials, Effects & Devices, Estes Park, CO, June 1995.

73. Hesselink, Lambertus, "Holographic Systems" National Media Labs, Holographic Storage Review, Boulder, CO, June 1995.

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74. Hesselink, Lambertus, "Optical Signal Processing & Holography," Gordon Research Conference, Optical Information Processing & Holography, Boston, MA, June 1995.

75. Hesselink, Lambertus, "Volume Holographic Storage & Retrieval of Digital Data," International Symposium on Optical Memory '95, Ishikawa, Japan, August 1995.

76. Hesselink, L.; Heanue, J. F.; Bashaw, M. C.; "Review of system design issues of digital holographic memories," 1995 Annual Meeting on the Optical Society of America, Portland, OR, September 10-15, 1995.

77. Sixth International Symposium on Computational Fluid Dynamics, The Japanese Society of Computational Fluid Dynamics, invited paper "Future Extraction from CFD Solutions," Lake Tahoe, CA, September 1995.

78. Hesselink, L.; Heanue, J. F.; Bashaw. M. C.; "Digital holographic data storage devices," High-Density Data Recording and Retrieval Technologies, Philadelphia, October 23-24, 1995.

79. SPIE-Photonics East '95, International Symposium on Information, Communications and Computer Technology, Applications and Systems, "Digital Volume Holograph Data Storage Devices," Philadelphia, PA, October 1995.

80. Hesselink, L., "Digital Volume Holographic Data Storage Devices," SPIE Photonics East '95, Philadelphia, PA, October 22-13, 1995.

81. Hesselink, L., "Optical Data Storage Systems," IEEE/LEOS (Lasers and Electro-Optics Society), San Francisco, CA November 1, 1995.

82. Tudelft, invited doctoral committee, "Selective Visualization Techniques for Curvilinear Grids," The Netherlands, December 1995.

83. Hesselink, L.; "Holographic Storage & Retrieval of Digital Data" OSA (OC '95), Spatial Light Modulators & Application Topical Meting, Salt Lake City, March 1995.

84. Hesselink, L.; "Holographic Storage Materials & Systems," American Physical Society, San Jose, CA, March 1995.

85. Hesselink, L.; "Materials for Digital Holographic Data Storage," NOMA, 2nd Mediterranean School & Topical Meeting, Milan, Italy, May 1995.

86. Hesselink, L.; "Topology of Tensor Fields," Graphicon '95, 5th International Conference on Graphics & Visualization, St. Petersburg, July 1995.

87. Hesselink, L.; "Review of Systems Design Issues of Digital Holographic Memories," OSA '95 Topical Meet, Photosensitivity & Quadractic Nonlinearity in Glass Waveguides: Fundamentals and Applications, Portland, OR, September 1995.

88. Hesselink, L.; "Digital Volume Holographic Data Storage Devices," SPIE-Photonics East '95,International Symposium on Information, Communications and Computer Technology Applications and Systems, Philadelphia, PA, October 1995.

89. ICASE workshop, "Visualizing Time-Varying Data, organizer, Williamsburg, VA, September 1995.

90. IEEE Computer Society, IEEE Visualization '95, tutorial "Visualization and Topology of Vector-Tensor Fields," Atlanta, GA October 1995.

91. IS&T SPIE, Symposium on Electronic Imaging an Technology-Photonics West '96, member organizing program committee, Practical Holography X, San Jose, January 1996.

92. Hesselink, L., "Holographic Data Storage System," International Symposium on Holographic Memories '96, Greece, May 12-15, 1996.

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93. International Symposium on Holographic Memories '96, invited presenter/program committee, " Holographic Data Storage System," May 1996, Greece

94. Hesselink, L., Short Course: Holographic Data Storage, CLEO/QELS, Anaheim, CA June 2-5, 1996.

95. Downing, E. A.; Hesselink, L.; Ralston, John; Macfarlane, Roger; "A Three-Color, Solid-State, Three-Dimensional Display", submitted Science Paper, June 1996.

96. Downing, E. A.; Hesselink, L.; "A Performance Comparison of Fluoride Glasses, " 10th International Symposium on Non-Oxide Glasses, Corning, New York, June 19-22, 1996,

97. Akella, A.; Downing, E. A.; Hesselink, L.; "New Fluoroindate Glass Compositions, " 10th International Symposium on Non-Oxide Glasses, Corning, New York, June 19-22, 1996,

98. CLEO/QELS, invited short course: Holographic Data Storage, Anaheim, CA, June 1996.

99. Sincerbox, G. T.; Hesselink, L.; "Removing the materials bottleneck in holographic storage," Non-Linear Optics Conference, Maui, Hawaii, July 8-12, 1996.

100. Hesselink, L., "Fundamental Materials & Devices Issues for Digital Holographic Data Storage," Non-Linear Optics Conference, Maui, Hawaii, July 8-12, 1996.

101. NLO Meet, "Fundamental Materials and Devices Issues for Digital Holographic Data Storage," and "Digital Holographic Data Storage Systems," Hawaii, July 1996.

102. Hesselink, L., "Holographic Digital Data Storage System," Optical Society of Korea International Committee for Optics (invited plenary lecture and chair), Taejon, Korea, August 19-23, 1996.

103. Hesselink, L., "Photorefractive Optical Memories," 3rd ECAP-Polar Dielectrics, plenary lecture, Bled, Slovenia, August 26-29, 1996.

104. ICO XVII 1996 Optics for Science and New Technology, plenary lecture and chair, "Holographic Digital Data Storage System," Taejon, Korea, August 1996.

105. 3rd ECAP-Polar Dielectrics, J. Stephen Institute, invited plenary lecture, "Photorefractive Optical Memories, " Bled, Slovenia, August 1996.

106. OSA Annual Meetings, ILS-XCII Optics and Imaging Center, "Symposium on Large Scale Digital Holographic Memories," Rochester, NY, October 1996.

107. OSA Annual Meetings, ILS-XCII Optics and Imaging Center, paper, "Materials and Systems Issues for Digital Holographic Data Storage," Rochester, NY, October 1996.

108. Photonics China, SPIE's International Symposium on Lasers, Optoelectronics and Microphotonics, invited talk "Digital Holographic Data Storage," L. Hesselink, M. C. Bashaw, Stanford University, J. F. Heanue, A. J. Daiber, Optitek, Beijing, China, November 1996.

109. Photonics China, SPIE's International Symposium on Lasers, Optoelectronics and Microphotonics, invited paper, "Digital Holographic Data Storage, Beijing, China, November 1996.

110. Physics of Quantum Electronics-26th Winter Colloquim, invited talk, "Holographic Memory Systems for Digital Video Applications," Snowbird, UT, January 1997.

111. Applied Science Seminar-LLNL, invited talk, "The Encyclopedia Britannica inside the head of a pin," Livermore, CA, February 1997.

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112. Physics of Quantum Electronics-26th Winter Colloquim, invited paper, "Holographic Memory Systems for Digital Video Applications," Snowbird, UT, January 1997.

113. Applied Science Seminar-LLNL, invited paper, "The Encyclopedia Britannica inside the head of a pin," Livermore, CA, February 1997.

114. University of Oregon Colloquim, invited talk, "Review of holographic data storage," Eugene, OR, April 1997.

115. Baetjer Seminar, invited Baetjer lecturer, "The Encyclopedia Britannica inside the head of a pin," Princeton University, New Jersey, April 1997.

116. Baetjer Seminar, invited Baetjer lecturer, "Tensor datasets: how do we analyze and visualize them," Princeton University, New Jersey, April 1997.

117. University of Oregon Colloquim, invited paper, "Review of holographic data storage," Eugene, OR, April 1997.

118. Lasers and Electro-Optics/Quantum Electronics & Laser Science Conference (CLEO/QELS '97), short course, "Holographic Storage," Baltimore, MD, May 1997.

119. Sony Corporation, invited talk, " The Encyclopedia Britannica inside the head of a pin," Tokyo, Japan, June 6, 1997.

120. Hitachi CRL, invited talk, "Holographic digital data storage system, Tokyo, Japan, June 6, 1997.

121. Waseda International Symposium & 6th Topical Meeting of Photorefractive Materials, invited talk, "The Encyclopedia Britannica inside the head of a pin?", Tokyo and Chiba, Japan, June 1997.

122. Waseda International Symposium on Phase Conjugation & Wave Mixing (Waseda Symposium), invited talk, "Recent Advances in Digital Holographic Data Storage," Waseda University, Tokyo, Japan, June 8-10, 1997.

123. Waseda International Symposium on Phase Conjugation & Wave Mixing (Waseda Symposium), invited talk, "Radial inhomogeneties in a-axis grown strontium barium niobate fibers prepared by laser heated pedestal growth technique in different conditions," Waseda University, Tokyo, Japan, June 8-10, 1997.

124. 1997 Topical Meeting on Photorefractive Materials, Effects and Devices (PR '97), invited talk, "Phase-instabilities, scattering centers in oxide crystals addressed to high density holographic data storage systems," Nihon Aerobics Center, Chiba, Japan, June 11-13, 1997.

125. AIAA Computational Fluid Dynamics Conference, Scientific Visualization, invited paper, "Visualization of 3-D Tensor Fields," Snowmass, CO, June 1997.

126. 1997 Topical Meeting on Photorefractive Materials, Effects and Devices (PR '97), invited paper, "Phase-instabilities, scattering centers in oxide crystals addressed to high density holographic data storage systems," Nihon Aerobics Center, Chiba, Japan, June 11-13, 1997.

127. Lasers & Electro-Optics/International Quantumm Electtronics Conference, Short Course #108, "Holographic Data Storage", San Francisco, CA May 5-7, 1998.

128. Presentation at 25th International Conference on Computer Graphics and Interactive Technique Conference, July 19-25, 1998, Orlando, Florida, "Vector Field Comparisons Using Earth Mover's Distance," by Yingmei , Rajesh Batra, and Lambertus Hesselink.

129. Presentation at International Symposium on Optical Science, Engineering and Instrumentation, SPIE's 43rd Annual Meeting, July 19-24, 1998, "Precompensated two-color digital holographic storage," by Eric Bjornson and Lambertus Hesselink.

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130. Presentation at SPIE conference, San Diego, California, July 22-24, 1998, "Properties of compositional volume grating formation in photoactive species induced polymerization processes" by Loukas Paraschis, Lambertus Hesselink and Annapoorna Akella.

131. Presentation at SPIE conference, San Diego, California, July 22-24, 1998, " Statistical analysis of photopolymer volume grating fluctuations in a holographic digital data storage system" by Loukas Paraschis and Lambertus Hesselink.

132. Presentation at Nonlinear Optics '98 Materials, Fundamentals and Applications Topical Meeting, August 9-14, 1998, Princeville, Kauai, Hawaii, "Statistical Analysis of Polymer Grating Distortions in Volume Holographic Digital Storage, " by L. Paraschis and L. Hesselink.

133. Presentation at Nonlinear Optics '98 Materials, Fundamentals and Applications Topical Meeting, August 9-14, 1998, Princeville, Kauai, Hawaii, "Properties of Compositional Volume Grating Recording in Photopolymers," by L. Paraschis and L. Hesselink.

134. Presentation at Nonlinear Optics '98 Materials, Fundamentals and Applications Topical Meeting, Kauai, Hawaii, August 10-14, 1998, Cat. No,. 98CH36244, p. 251-3 (conference paper), "Fundamental issues related to digital holographic data storage," by Lambertus Hesselink and Loukas Paraschis.

135. Invited talk at Nonlinear Optics '98, Materials, Fundamentals and Applications Topical Meeting, August 9-14, 1998, Princeville, Kauai, Hawaii, "Fundamental Issues Related to Digital Holograph Data Storage," by Lambertus Hesselink.

136. Presentation at Photonics China '98 Conference, Beijing, China, September 16-17, 1998, invited paper, "Fundamental issues related to digital holographc data issues," by Lambertus Hesselink.

137. Presentation at International Symposium on Optical Memory '98, Tsukuba, Japan, October 20-22, 1998, invited talk, "Non-Volatile Digital Holographic Memories," by Lambertus Hesselink.

138. Invited Lecture at Silver Jubilee Symposium of the Optical Society of India, Optics and Opto-Electronics Conference, Irde Dehradum, India, "High performance digital holographic optical memories, "by Lambertus Hesselink, December 9-12, 1998.

139. Presentation at the International Photonics Conference, Symposium on Photorefractive Holography and Applications, Taipe, Taiwan, December 16-18, 1998, invited talk, "A compact digital holographic storage system: design and performance," by Lambertus Hesselink.

140. Invited Lecture at Silver Jubilee Symposium of the Optical Society of India, Optics and Opto-Electronics Conference, Irde Dehradum, India, "High performance digital holographic optical memories, "by Lambertus Hesselink, December 9-12, 1998.

141. International Workshop on Holographic Data Storage, Stanford Organizer, Nice, France, March 8-11, 1999.

142. Presentation at the SCCE II International Workshop "Scientific Computing in Chemical Engineering II," invited presentation, "Topology Based Comparison Technique for Vector Fields Using Earth Mover's Distance," by Lambertus Hesselink, Hamburg, Germany, May 2-28, 1999.

143. Presentation at the Distinguished Lecturer's Series, Livermore, CA June 1999, invited talk "Holographic Data Storage," by Lambertus Hesselink

144. Presentation at the Xerox PARC Forum, June 10, 1999, Palo Alto, invited talk "Volumetric High Density Data Storage," by Lambertus Hesselink

145. Presentation at the NSIC Annual Meeting, June 22, 1999, Monterey, CA , Three Dimensional Storage: "1 Gbit Holographic Data Storage System Demonstrator."

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146. Presentation at the ISOM/ODS '99 Conference, "Physical Properties of volume holographic recording utilizing, photoinitiated polymerization for nonvolatile digital data storage,"Paraschis, Loukas; Sugiyama, Yasuyuki; and Hesselink, Lambertus, July 11-15, 1999, Koloa, Hawaii.

147. Presentation at the SPIE, IDEMA/NIST "Recent Advances in Metrology, Characterization and Standards For Optical Digital Data Disks" Conference, Denver, CO, July 18-13, 1999, invited paper "High density Optical Data Storage," by Lambertus Hesselink.

148. Presentation at the ETOP '99, 6th International Meeting on Education and Training in Optics and Photonics Workshop, invited, "Cyberlab," Cancun, Mexico, July 28-31, 1999.

149. Presentation at the ICO VIII, 18th congress of the International Committee for Optics, "Physical properties of photopolymer recording for on-volatile volume holographic storage," Paraschis, L., Sugiyama, Y., and Hesselink, L., San Francisco, CA August 2-6, 1999.

150. Presentation at the IDEMA/DISKCON Conference, invited paper "Fundamental Aspects of Digital Holographic Data Storage, San Jose, CA," San Jose, CA September 21, 1999.

151. Short Course, invited OSA Annual Meet, "Holographic Storage," Santa Clara, CA, September 26, 1999.

152. Presentation at the Photonik Symposium/Volkswagen-Stiftung, invited paper, "High speed digital holographic data storage Demonstrator," Duisburg, Germany, October 1, 1999.

153. Presentation at the Leos '99 Annual Meeting, invited paper, "Optical Data Storage Systems," San Francisco, CA, November 9, 1999.

154. Short Course, OSA Annual Meet, invited, "Holographic Storage, "September 26, Santa Clara, CA.

155. Presentation Gerhard-Mercator-Universitat-GH-Duisburg Volkswagen-Stiftung, Photonik Sympoisum/Volkswagen-Stiftung, invited paper, "High Speed Digital Holographic Data Storage Demonstration," Duisburg, Germany, October 1, 1999.

156. Presentation at the LEOS '99 Annual Meeting, invited paper, "Optical Data Storage Systems", November 9, 1999, San Francisco, CA.

157. National Instruments Week, Education Day, "Cyberlab, A New Paradigm in Distance Learning," Bjornson, Eric; Rizal, Dharmarus, Hesselink, Lambertus, August 19, 1999, Austin, TX.

158. WMC 2000, Society for Computer Simulation International. Invited, "Cyberlab: A New Paradigm in Distant Learning," San Diego, CA January 26, 2000.

159. NSF Workshop: Learning from the Net: The Leading Edge in Internet-Based, invited talk, "Cyberlab: A New Paradigm in Distant Learning," Stanford University, Stanford, CA, February 11, 2000.

160. APS March Meeting 2000, invited talk "From the Classroom to the Boardroom," Minneapolis, MN, April 19-21, 2000.

161. CLEO QELS 2000 Conference on Lasers and Electro-Optics, Invited Short Course, "Holographic Data Storage,". San Francisco, Moscone Center, May 8, 2000.

162. Optical Data Storage Conference IEEE/OSA/SPIE, invited paper/talk, " "3DR Technology," Vancouver, BC, Canada, May 14-18, 2000.

163. Optical Internet, The Next Generation, invited talk, "High Density Data Storage Technologies," Stanford Campus, Stanford, CA, May 16, 2000.

164. SSGRR-2000, invited presentation, "Cyberlab: A New Paradigm for Internet Learning," L, Hesselink, E. Bjornson and D. Rizal , L'Aquila, Italy, July 31-August 6, 2000.

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165. University of Latvia, ECAPD-5 Conference,invited Plenar/presentation, "Ultra High density Data Storage" by L. Hesselink, Jurmala, Latvia, August 27-30, 2000.

166. OSA Annual Meeting & Exhibit 2000, "Video Demonstration of high data rate holographic disk data storage system," William Phillips, Sergei Orlov, Eric Bjornson, Padma Sundaram, Lambertus Hesselink, Stanford, University; Robert Okas, Siros Technololgies, Inc., Providence, RI, October 2000.

167. OSA Annual Meeting & Exhibit 2000, "10 gigabit/second sustained optical data transfer rate froma holographic disk digital data storage system," Sergei Orlov, William Phillips Eric Bjornson, Lambertus Heselink, Stanford University; and Robert Okas, Siros Technologies, Inc., Providence, RI, October 2000.

168. MORIS/APDSC 2000, invited talk, "Ultra high density data storage, Nagoya, Japan, October 30 to November 2, 2000.

169. Ultra-High-Density Data Storage, Hesselink, L., Communications of the ACM: November 2000, v. 43, no. 11, p. 33-36, Stanford University, Palo Alto, CA.

170. IPC 2000. International Photonics Conference, invited talk, "Ultra-high capacity and performance optical

171. Data storage systems" L. Hesselink, S. Orlov and W. Phillips, Taiwan, December 12-15, 2000.

172. CLEO 2000 Conference, "High Transfer rate (1 Gbit/sec) high-capacity holographic disk digital storage system," by S. S. Orlov, E. Bjornson, W. Phillips, Y. Takashima, X. Li, and L. Hesselink, Stanford University, San Francisco, California, May 7-12, 2000.

173. SSGRR-2000 Conference, "Cyberlab: A New Paradigm for Internet Learning," by Lambertus Hesselink, E. Bjornson and Dharmarus Rizal, L'Aquila, Italy, July 31-August 6, 2000.

174. SPIE/Photonics West, SPIE Conference on Visual Data Exploration & Analysis, invited paper, "Visualization and vector and tensor fields and quantitative comparisons," D. A. Waldman, E. A. Cetin, R. T. Ingwall, R. A. Minns, Aprilis, Inc.; S. Orlov, W. Phillips, L. Hesselink, Stanford University, January 23, 2001, San Jose, CA

175. SPIE/Photonics West, SPIE Conference on Visual Data Exploration & Analysis, invited paper, "High-performance data storage in a rotating disk of Aprilis CROP recording medium," D. A. Waldman, E. A. Cetin, R. T. Ingwall, R. A. Minns, Aprilis, Inc.; S. Orlov, W. Phillips, L. Hesselink, Stanford University, January 23, 2001, San Jose, CA

176. European Media Laboratory, invited paper "Internet Assisted Laboratories," Heidelberg, Germany, January 2001.

177. CRISM Review, Future Technologies: Investigating New Optical Storage Technology AuthentiCorp and Advanced Applications – ReplTech, invited talk, "10 Gbit/sec Holographic Data Storage Demonstration," February 20, 2001, Los Angeles, CA.

178. ODS 2001, Optical Data Storage Conference, invited talk, Nano-aperture with ultra-high power throughput for VSAL," Xiaolei Shi, Lambertus Hesselink, Stanford University, Robert L. Thornton, Siros Technololgies, Inc., April 24, 2001, Santa Fe, New Mexico .

179. University of San Francisco, invited talk "Optical Data Storage," San Francisco, CA, Aprl 16, 2001.

180. OSA 2001, "Nano-aperture with Power Throughput or Near Field Optical Applications", Xiaolei Shi, Robert L. Thornton, Lambertus Hesselink, October 14-18, 2001, Long Beach, CA

181. ISOM 2001, "Mechanisms for Enhancing Power Throughput from Nano-apertures for Near Field Optical Data Storage", Xiaolei Shi and Lambertus Hesselink, October 10-16, 2001, Taipei, Taiwan.

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182. Associative recall in a volume holographic storage system based on phase-code multiplexing, Berger, G; Denz, C; Orlov, SS; Phillips, B, Hesselink, L.; Applied Physics B: Lasers and Optics, December 2001; v. 73, no. 8, p. 839-845.

183. Distance Education Colloquy, invited talk, " Remotely Controlled Laboratories," San Diego, CA January 6-8, 2002

184. SPRC Annual Meeting, Joseph Matteo, Xiaolei Shi, Yin Yuen, Lambertus Hesselink, "Optical nano-tweezer using sub-wavelength "C"-aperture", Stanford Photonics Research Center annual meeting , Stanford University, Palo Alto, CA, September 16-18, 2002.

185. ICOLA'02 Conference, Lambertus Hesselink, Xiaolei Shi, "Ultra-high Power Transmission Through a Single Nano-Aperture", International Conference on Opto-electronics and Laser Applications (ICOLA), Jakarta, Indonesia, October 2-3, 2002 (Invited).

186. SSGRR 2002W International Conference on Advances in Infrastructure for e-Business, e-Education, e-Science and e-Medicine on the Internet, invited plenary talk: "The Next Wave of Internet Applications: Seamless Integration of Devices, Users and Data," L. Hesselink, January 22-27, 2002, L'Agila, Italy.

187. USAF: Workshop "World Wide Web," Project Kaleidoscope, invited talk, "Web-assisted Inter-institutional Collaborations for Teaching and Research, Colorado Springs, CO, February 8-10, 2002.

188. IDEMA 2002, DISKCON, International Exhibition for Disk Drive and Media Technology, invited paper, "Recent Advances in Holographic Data Storage: Pre-cursor for Commercialization," Lambertus Hesselink and Sergei Orlov, and invited talk: "Holographic Storage Not a Dream Anymore,' L. Hesselink, April 11-12, 2002, Tokyo, Japan.

189. Hesselink, L., and Orlov, S., "Recent Advances in Holographic Data Storage: Pre-Cursor for Commercialization," proceedings ISOM 2002.

190. Hesselink, L, "Internet-Based Remotely Controlled Laboratories," proceedings DMS 2002.

191. Fe, Y., Bonitou, D., Schuwelywk, A., Hesselink, L., Sturman, B., and Odoulov, S., "Coupling of Orthogonally Polarized Waves and Vectorial Coherent Oscillation in Periodically Poled LiNb03," J.A.P., May 2002.

192. CLEO/QELS 2002 Conference on Lasers and Electro-Optics, "High data rate (10 Gbit/sec) demonstration in holographic disk digital data storage system," Sergei S. Orlov, William Phillips, Eric Bjornson,.Lambertus Hesselink, and Okas, R., Long Beach, CA , May 21-23, 2002.

193. Schott Glass, Workshop on Glass and Photonics Revolution, invited paper, "Materials requirements for dense optical storage," Bad Soden, Germany, May 28-29, 2002.

194. IUMRS-ICEM2002 Conference, invited paper, "Photorefractive Holographic Storage," Xi'an, China, June 10-14, 2002.

195. DMS-2002 conference, keynote speaker: Distance Learning Research, Hotel Sofitel, San Francisco, CA September 26-28, 2002.

196. SPRC Annual Meeting, Xiaolei Shi, Robert Thornton, Lambertus Hesselink, "Ultra-high optical transmission through a single "C"-shaped nano-aperture", Stanford Photonics Research Center annual meeting, Palo Alto, CA, September 16-18, 2002.

197. ICOLA '02 International Conference on Opto-electrotechniques and Laser Applications, invited talk: "Ultra-high Power Transmission Through a Single Nano-Aperture," Hesselink, L; Shi, Xiaolei; Matteo, Joe; Sun,Lying,,Jakarta,Indonesia,September29-October5,2002.

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198. Magnetics & Magnetic Devices Lab, Toyohashi University of Technology, invited lecture: "Selected Topics in Electrical and Electronic Engineering I", and "Advanced Topics in Electrical and Electronic Engineering I," Tokyo, Japan, October 6-7, 2002

199. Magnetics and Magnetic Devices Lab, Toyohashi University of Technology, invited lecture "Selected Topics in Electrical and Electronic Engineering I," and "Advanced Topics in Electrical and Electronic Engineering I," Lambertus Hesselink, Tokyo, Japan, October 6-7, 2002 (invited).

200. J. W. Son, Y. Yuen, S. Orlov, W. Phillips, L. Galambos, V. Shur, and L. Hesselink,, "Submicron Ferroelectric Domain engineering in $LiNbO_3$ thin films grown by liquid phase epitaxy", *Materials Research Society Fall Meeting*, Boston, MA, 2003.

201. J. W. Son, S. Orlov, W. Phillips, and L. Hesselink,, "Parametric studies on Suppressing Secondary Phases in Lithium Niobate Thin Films deposited by Pulsed Laser Deposition", *Materials Research Society Fall Meeting*, Boston, MA, 2003.

202. J. W. Son, Y. Yuen, S. Orlov, W. Phillips, L. Galambos, V. Shur, and L. Hesselink,, "Domain engineering in $LiNbO_3$ thin films grown by liquid phase epitaxy", *Laser Science XIX, OSA Annual Meeting*, Tucson, AZ, 2003.

203. J. W. Son, Y. Yuen, S. Orlov, W. Phillips, L. Galambos, V. Shur, and L. Hesselink,, "Direct-write e-beam domain engineering in $LiNbO_3$ thin films grown by liquid phase epitaxy", *Stanford Photonics Research Center Annual Meeting*, 2003.

204. J. W. Son, Y. Yuen, S. Orlov, W. Phillips, L. Galambos, V. Shur, and L. Hesselink,, "Domain engineering in $LiNbO_3$ thin films grown by liquid phase epitaxy," Materials Research Society Symposium, Proceedings 2003, v. 784, p 523-528, Ferroelectric Thin Films XII, December 1-14, 2003, Boston, MA

205. SPIE/Photonics West Conference, "Ultra-high performance optical memories," Lambertus Hesselink, San Francisco, CA January 25-31, 2003 (invited).

206. Applied Physics Seminar, Stanford University "Ultra-high Light Transmission Through a Single C-shaped Nano-Aperture," Lambertus Hesselink, March 3, 2003, Stanford University, Stanford, CA.

207. Toyohashi University of Technology, guest speaker COE project, March 7-14, 2003, Symposium Hiotel Nikko, Toyohashi, Japan.

208. OSA Topical Meeting, Optical Data Storage Conference, co-presider, "Three-D Storage, " Lambertus Hesselink, May 11-14, 2003, Vancouver, Canada

209. A new dynamic bandwidth allocation protocol with quality of service in Ethernet-based passive optical networks, An, Fu-T.; Hsueh, Yu-L.; Kim, KS; White, IM, Kazovsky, LG, Opt. Commun. Res. Lab., Stanford University, CA, Wireless and Optical Communication (WOC), 2-4 July 2003, Banff, Canada, p. 165-9.

210. IASTED WOC 2003, Wireless and Optical Communications Conference, Conference Chair, July 14-16, 2003, Banff, Alberta, Canada.

211. OSA ETOP 2003 Meeting, invited talk "Internet Assisted Laboratories: Design, Educational Use, and Pedagogical Evaluation," Lambertus Hesselink, October 6-8, 2003, Tucson, AZ.

212. APNF-04 Conference, invited talk, Hesselink, L.; Matteo Joe; Leen, Brian; Yuen, Yin; Sun, Liying, "Optical Tweezers Using Highly Efficient Sub-wavelength C-shaped Apertures," Lambertus Hesselink, October 13-17, 2003, Taipei, Taiwan

213. CRDF Conference, Kiev, October 18-22, 2003.

214. Denz, C., Beger, G., Muller, K. O., Tschudy, T., Orlov, S., Phillips, W., and Hesselink, L., "Content Addressable Data Storage in Holographic Memories Based on Phase-Coded Multiplexing,"

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215. Dubois, M., Shi, Xiaolei, Lawrence, B., Tian, P., Boden, E., Chan, K. P., Nielsen, M. and Hesselink, L., "Characterization of a Preliminary Narrow-Band Absorption Material for Holographic Data Storage, ODS Meeting, 2004.

216. J. W. Son, Y. Yuen, S. Orlov, W. Phillips, L. Galambos, V. Shur, and L. Hesselink,, "~ 200 nm Periodic Domain Structure Fabricated in Liquid Phase Epitaxy $LiNbO_3$ Thin Films by Direct-Write E-Beam", *Stanford Photonics Research Center Annual Meeting*, 2004.

217. J. W. Son, Y. Yuen, S. Orlov, W. Phillips, L. Galambos, V. Shur, and L. Hesselink,, "Submicron Ferroelectric Domain engineering in $LiNbO_3$ thin films grown by liquid phase epitaxy", *Ferroelectric Thin Films XII*, 2003 MRS Fall Meeting Proceeding Vol. 784, C 10.8., 2004.

218. J. W. Son, S. Orlov, W. Phillips, and L. Hesselink,, "Parametric studies on Suppressing Secondary Phases in Lithium Niobate Thin Films deposited by Pulsed Laser Deposition", *Ferroelectric Thin Films XII*, 2003 MRS Fall Meeting Proceeding Vol. 784, C 11.24., 2004.

219. Son, Ji-Won; Yuen, Yin; Orlov, Sergei S.; Phillips, William, Galambos, Ludwig; Shur V. Ya; Hesselink, Lambertus, paper "Direct-Write e-Beam Periodically Polled ~400 nm Domains in Lithium Niobate Think Films Grown by Liquid Phase Epitaxy," Ukranian Journal of Physics, Volume 49, No. 4, pages 382-387, April 2004.

220. Shi, Xiaolei, Hesselink, Lambertus, "Design of a C aperture to achieve $\lambda/10$ resolution and resonant transmission, J. Opt. Soc. Am. B, Vol 21, No. 7, July 2004.

221. Yin, Xiaobo and Hesselink, Lambertus, "Weak Value and Resonance Enhanced Weak Value: A revisit of Total Internal Reflections," accepted for publication Applied Physics Letters, June 2004.

222. Hesselink, Lambertus, Sun, Liying; invited paper" Pointing Vector Topologies and Applications of C-Shaped Nano-Apertures," ICO '04, Tokyo, Japan, July 2004.

223. Hesselink, Lambertus, "Internet assisted laboratories," International Symposium, Remote Engineering and Virtual Instrumentation, September 28-29, 2004, Villach, Austria.

224. Hesselink, Lambertus; Leen, Brian; Matteo, Joe; Sun, Lying; Yuen, Yin, "Ultra-high density data storage." LEOS 2004, November 11-17, 2004, Puerto Rico.

225. J. W. Son, Y. Yuen, S. Orlov, W. Phillips, L. Galambos, V. Shur, and L. Hesselink,, "Direct-write E-beam Sub-Micron Domain Engineering in Lithium Niobate Thin Films grown by Liquid Phase Epitaxy", 2005 SPIE Photonics West, January 2005 (accepted).

226. Hesselink, Lambertus, Matteo, Joe; Yuen, Yin; Leen, Brian; Sun, Liying, paper "Nano-Photonic Components for Network Applications, KEIO, February 2005.

227. Dubois, M., Shi, Xiaolei, Lawrence, B., Tian, P., Boden, E., Chan, K. P., Nielsen, M. and Hesselink, L., paper, "Characterization of a Preliminary Narrow-Band Absorption Material for Holographic Data Storage, February 2005.

228. Ji-Won Son and L. Hesselink, "Sub-micron Ferroelectric Domain Engineering in Liquid Phase Epitaxy $LiNbO_3$ by Direct-Write e-Beam Techniques", Plenary Talk, 10^{th} Int. Conf. on photorefractive effects, materials and devices, Hainan, P. R. China, July 2005.

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230. Ji-Won Son, S. Orlov, W. Phillips, and L. Hesselink, "Pulsed laser deposition of single phase $LiNbO_3$ thin film waveguides", International Conference on Electroceramics-2005, Seoul, Korea, 2005.

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231. Lambertus Hesselink, Invited Talk: " Ultra-high density data storage," IEEE LEOS 2004, The 17th Annual Meeting of the IEEE Laser & Electro-Optics Society Puerto Rico, November 11-17, 2004.

232. Hesselink, Lambertus, Plenary Talk "Internet assisted laboratories," International Symposium, Remote Engineering and Virtual Instrumentation, September 28-29, 2004, Villach, Austria.

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234. Hesselink, Lambertus, Plenary Talk:" Ultra-High Density Optical Data Storage," The 1st Symposium of CREST, JST, Tokyo, Japan, Dec 11-15, 2004,

235. J. W. Son, Y. Yuen, S. Orlov, W. Phillips, L. Galambos, V. Shur, and L. Hesselink,, "Direct-write E-beam Sub-Micron Domain Engineering in Lithium Niobate Thin Films grown by Liquid Phase Epitaxy", 2005 SPIE Photonics West, January 2005

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237. Dubois, M., Shi, Xiaolei, Lawrence, B., Tian, P., Boden, E., Chan, K. P., Nielsen, M. and Hesselink, L., paper, "Characterization of a Preliminary Narrow-Band Absorption Material for Holographic Data Storage, February 2005.

238. Lambertus Hesselink, Plenary Talk: "High Density Holographic Data Storage,"Holography '05, International Conference on Holography, Optical Recording and Processing of Information, Varna, Bulgaria, "Frederic Joliot-Curie" Congress Center, May 21-25, 2005.

239. Ji-Won Son and L. Hesselink, "Sub-micron Ferroelectric Domain Engineering in Liquid Phase Epitaxy $LiNbO_3$ by Direct-Write e-Beam Techniques", Plenary Talk, 10th International Conference on Photorefractive Effects, Materials and Devices, Hainan, P. R. China, July 2005.

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241. Lambertus Hesselink, Plenary Talk: "Holographic Data Storage,"ESOM/ODS International Symposium on Optical Memories and Optical Data Storage, Homolulou, Hawaii, July 10-13, 2005.

242. Ji-Won Son, S. Orlov, W. Phillips, and L. Hesselink, "Pulsed laser deposition of single phase $LiNbO_3$ thin film waveguides", International Conference on Electroceramics-2005, Seoul, Korea, 2005.

243. Liying Sun, Rajesh K. Batra, Xiaolei Shi, Lambertus Hesselink, "Topology Visualization of the Optical Power Flow through a Novel C-shaped Nano- Aperture," Visualization Octobeer 10-15, 2004, accepted for October 5, 2004 conference proceedings.

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245. J. W. Son, Y. Yuen, S. Orlov, W. Phillips, L. Galambos, V. Shur, and L. Hesselink,, "Direct-write E-beam Sub-Micron Domain Engineering in Liquid Phase Epitaxy $LiNbO_3$ Thin Films", *SPIE Proceedings*, Vol. 5728, 283-290, 2005.

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267. Goos-Hanchen Surface Plasmon Resonance Sensor, Lambertus Hesselink, American Chemical Society Meeting, 2007, Boston

268. Holographic Data Storage, Present and Future, Lambertus Hesselink, Asia Pacific Data Storage Conference, 2006, Lakseshore Hotel, Hsin Chu, Taiwan

269. Significant Performance Enhancement of Nano-photonic Devices by Using Resonant Surface Plasmons, Lambertus Hesselink, Xiaobo Yin, Brian Leen, Paul Hansen, Yin Yuen, International Meeting on Photonics, UEC 2006, Japan

270. Surface Plasmon Enhancement of Nano-photonic Devices, Lambertus Hesselink, ICOLA 2007, Indonesia

271. Significant Performance Enhancement of Nano-Photonic Devices by Using Resonant Surface Plasmons, Lambertus Hesselink, Xiaobo Yin, Brian Leen, Paul Hansen, Yin Yuen, International Meeting on Photonics 2006, Hyderabad, India

272. "Optical Designs for Page-based and Bit-based Holographic Data Storage Systems", Lambertus Hesselink, FujiFilm Symposium, December 2006

273. Single Bit holographic data storage system, Lambertus Hesselink, GE Global Research Center, 2007

274. L. Hesselink, Ultra-High Throughput C-Apertures for Applications in Optical Data Storage and NSOM Imaging, Asian Pacific Conference on Near Field Optics, Jeju Island, Korea, November 25-27, 2009 (Keynote)

275. L. Hesselink, Bell-Labs for Energy, Department of Energy, Office of the Assistant Secretary for Energy, October 2009

276. L. Hesselink, Fundamental Principles of High Performance C-apertures and Their Applications, Seoul National University, November 29, 2009

277. L. Hesselink, Near-Field Optical Transducers, Techniche 2010, Guwahati, India (Keynote)

278. L. Hesselink, Surface Plasmon Resonance Effects, California Institute of Technology, February 17, 2010

279. L. Hesselink, Green Energy Car Project, University of Twente, December 7, 2009

280. L. Hesselink, Energy Research Directions for Sustainability, University of Eindhoven, March 201

281. L. Hesselink, Sustainable Energy Research Directions, Royal Dutch Shell, March 2010

282. L. Hesselink, Recent developments in Near-Field Optical Transducers for Data Storage, ODS Annual Meeting, Boulder Co, May 2010

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283. L. Hesselink, Fundamental Issues related to near-field optical transducers, ODS Short Course Symposium, May 2010

284. Y. Takashima. "A Systematic Comparison of Bit-based and Page-based Holographic Storage Systems". Invited Talk in *Optical Data Storage Topical Meeting*, Colorado, (2010).

285. Y. Takashima, Y. Cheng, P. Hansen, Y. Yuen, L. Hesselink, R. F. Pease, J. R. Maldonado and P. A. Pianetta. "Demonstration of $\lambda/50$ optical spot using a C-Aperture Nano Tip for Electron Photo-emitter applications". Invited Talk in Annual Symposium of Stanford Photonics Research Center, Stanford CA, (2010)

286. A. Koç, Y. Takashima, and L. Hesselink, "Systematic analysis of the validity regions of scalar diffraction integral and angular spectrum method," Biomedical Optics and 3-D Imaging: OSA Optics and Photonics Congress, Florida, USA, 2010.

287. Invited paper, Hesselink, L., Fundamental aspects of near-field optical transducers for energy assisted magnetic recording, NSIC Annual Meeting, 2010

288. Invited paper, P. Hansen, Y. Zheng, E. Perederey, and L. Hesselink, "Adjoint FDTD for Nanophotonic Device Optimization," in Joint International Symposium on Optical Memory and Optical Data Storage, OSA Technical Digest (CD) (Optical Society of America, 2011), paper OTuE2.2011

289. Plenary paper, Hesselink, L. How one year as a Fulbright scholar at Caltech turned into a lifetime benefit, Caltech EE Centennial, 2011

290. Invited talk, Hesselink, L. Sustainable Energy Systems, Distinguished speaker series, Energy Center the Netherlands, 2011

291. Invited speaker, Hesselink, L. Content distribution systems, Connections, CES 2011, :as Vegas

292. Invited speaker, Hesselink, L. Digital Content Distribution Systems, Digital Hollywood, New York, 2011

293. Hesselink, L. Invited paper, 3-D wearable head-up display, Japanese Optical Society, Tokyo, Japan, 2011

294. Hesselink, L. Novel X-ray phase contrast imaging systems, DHS, Washington, DC. , 2011

295. Plenary keynote paper, Hesselink, L., Hansen, P., Takashima, Y., Fundamental understanding of optical near-field transducers for data storage, International Society of Optical memories (ISOM)/ Optical Data Storage (ODS) 2011, Hawaii

296. Plenary paper, Hesselink, L. Fundamentals of near-field transducers and applications to <20nm microscopy and photon-electron sources, C. Dentz Symposium, Munster, 2011

297. Invited paper, Hesselink, L., Fundamental principles underlying near-field transducers for data storage, IQEC/CLEO Pacific Rim, IEEE, Sydney Australia, 2011

298. Plenary paper, Hesselink, L., From the Classroom to the Boardroom; Lessons learned. Yonsei International Symposium Computer Technology Symposium, 2011

299. Plenary speaker, Hesselink, L., Sustainable energy systems, ACTI Annual Symposium, Dutch Center for Technology Innovation, Annual meeting on innovation, speaker and panel member, 2011

300. Invited speaker at Joe Goodman Symposium, Hesselink, L., Sub 20 nm Photo-Electron Beam Arrays, 2011

301. Invited paper, Koc, A, Ozaktas, H.M., Hesselink, L., Fast and accurate algorithms for quadratic phase integrals in optics and signal processing, SPIE, 2011

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302. Invited paper, Hansen, P., Perederey, E, Hesselink, L., Adjoint FDTD for Nanophotonic Device Optimization, ISOM/ODS, Hawaii, 2011

303. Invited paper, Takashima, Y, Hesselink, L., Design and implementation of wearable head-up display for mobile phone applications, Digital Holography and 3-D imaging DH-2011, OSA 3-D Symposium, Tokyo, Japan, 2011

304. Invited speaker, Hesselink, L. Fundamentals and applications of nano-photonics, International School on Quantum and Nano Computing Systems and Applications at Dayalbagh Educational Institute, Agra, India, 2011

305. Hesselink, L. Sustainable Energy Systems, Twente University, Netherlands, 2011

306. Hesselink, L. Energy flow and sustainable energy research, Delft University, Netherlands, 2011

307. Hesselink, L. Fundamentals and applications of nano-apertures, Caltech distinguished lecture series, 2011

308. Hesselink, L., From the classroom to the boardroom, lessons learned, Yonsei distinguished lecture series, Yonsei University, 2011

309. Keynote, L. Hesselink, "Secure Content Storage Association", ODS 2012, Tucson AR

310. Invited, L. Hesselink, Y. Takashima, "Wearable Head-up Display", CC3DMR, Seoul, Korea, June 2012

311. Invited, Juan R. Maldonado and Piero Pianetta, Yao-Te Cheng, Lambertus Hesselink, and R. Fabian Pease, Yuzuru Takashima, Chuong Huynh and Larry Scipioni, ""CsBr based photoelectron nano sources", Cold Beams Conference, Nimes, France, 2012

312. Invited, L. Hesselink, "Differential Phase Contrast Imaging for DHS applications", Non destructive testing Symposium, Maryland, 2012

313. Invited, L. Hesselink, "DPC imaging and Photo Electron Arrays for 3-D X-ray imaging", Industry day Symposium, Department of Homeland Security, Washington, DC, 2012

314. Invited, L. Hesselink, CES storage Symposium, Secure Content Storage Association, Las Vegas, 2012

315. Invited, L. Hesselink, Ambassadeurs meeting, "Renewable energy systems", 2012, Amsterdam

316. Invited, L. Hesselink, Faculty College, "Energy sequence for EE students", May 2012

317. Invited, L. Hesselink, Comcast broadcasting meeting, "Secure Content Storage Association", Denver, CO

318. Invited, L. Hesselink, "Nano photonics with application to optical data storage and imaging", Symposium Boulder CO

319. Invited, L. Hesselink, "Innovation at Universities", Dutch Symposium on Innovation, November 2012, The Hague

320. Invited, L. Hesselink, "Nano Photonics and Applications", 3-D Imaging Symposium, Yonsei, Korea, 2012

321. Invited, L. Hesselink, "Phase contrast tomography and X-ray source for homeland security applications, Industry day, Washington DC, September 18, 19 2012

322. Invited L. Hesselink, AP 2, "Nano Optics for application in data storage and imaging", Stanford University, October 2012

323. Invited L. Hesselink, "Optical data storage with nano technology", Yonsei University, Korea, October 2012

324. Invited, L. Hesselink, "Fundamental Principles of Nano Photonics", University of Colorado, May 2012

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325. Invited, L. Hesselink, Y. Takashima, "Wearable Head-up Display", CC3DMR, Seoul, Korea, June 2013

326. Invited, L. Hesselink, "Nano Optical Photo Electron Source", CC3DMR, Jeju Island, Korea, June 2013

327. Invited, L. Hesselink, "Differential Phase Contrast 3-D imaging", ISPDI, Beijing, June 2013

328. Invited, L. Hesselink, "Differential Phase Contrast 3-D Imaging system and Applications, DHS Symposium, Washington DC, August 2013

329. Invited, L. Hesselink, "Novel Photo-Electron Source for Application in Data Storage , 3-D X-Ray and Medical Imaging, IPC ODS meeting, September 2013

330. Invited, L. Hesselink, "DPC Imaging for Aviation Security Applications", September 2013

331. Invited, L. Hesselink, "Photo Electron X-Ray Source Array", SPRC, September 2013

332. Invited, L. Hesselink, "DPC for Aviation Security Applications", ADSA09, October 2013

333. Invited, L. Hesselink, "Recent Advances in DPC 3-D X-Ray Imaging", Imaging Symposium, October 2013

334. Invited, Carlo Scalo, Jeffrey Lin, Sanjiva K. Lele and Lambertus Hesselink, A numerical study of thermoacoustic Stirling heat engines, The Thermal \& Fluid Sciences Affiliates and Sponsors Conference at Stanford University (Feb. 2013)

335. Invited, Jeffrey Lin, Carlo Scalo, Sanjiva K. Lele and Lambertus Hesselink, Thermoacoustic Stirling heat engines and refrigerators, Stanford Energy Showcase at Stanford University (April 2013)

336. L. Hesselink, "DPC X-ray measurements of liquids", Duke University, November 2013

337. Invited, L. Hesselink, Differential Phase Contrats X-ray Imaging, CC3DMR, Jeju Island, Korea (2014)

338. Invited, L. Hesselink, "IT-Sligo meeting, Highly scalable on-line iLabs for MOOCS", (January 2014)

339. Invited, L. Hesselink, 2. Highly scalable on-line iLabs for MOOCS", Department of Medicine, Stanford University. (January 2014)

340. Invited, Y. Takashima, J. Kim, Y. Cheng, M. Yuen, J. P. Wilde, L. Hesselink,"Design of X-ray Differential Phase Contrast Imaging System for High Energy and Wide Spectrum X-ray Applications" CLEO (2014)

341. Invited, Y. Takashima, J. Kim, Y. Cheng, M. Yuen, L. Hesselink, "Design and Analysis of an X-ray Differential Phase Contrast Imaging System with Grating-less X-ray Source and Detectors", IODC (2014)

342. Invited, Jeffrey Lin, Carlo Scalo, and Lambertus Hesselink, High- fidelity simulations of a standing-wave thermoacousticpiezoelectric engine, in 67th Annual Meeting of the APS Division of Fluid Dynamics, (San Francisco, CA), (Nov. 2014)

343. Invited, L. Hesselink, "DPC Imaging for Aviation Security Applications" (November 2014)

344. L. Hesselink, "3-D Differential Phase Contrast X-Ray Imaging: recent results", Collaborative Conference on 3D and Materials Research (CC3DMR) 2015, Busan, South Korea, (June 2015)

345. Invited, L. Hesselink, Thermo Acoustic Power Stick, Annual CHP meeting, Amsterdam, Netherlands, (May 2015)

346. L. Hesselink, Nobel 3D Diffferential Phase contrast X-ray Imaging for Aviation Security Applications, SPIE Security Meeting, Baltimore (May 2016)

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347. L. Hesselink, M. Yuen, Y-T Cheng, Thermo Acoustic Power Stick, Annual CHP Meeting, Amsterdam, Netherlands (May 2016)

348. L. Hesselink, M. Yuen, C-W. Chang, Y-T. Cheng, G. Herring, L. Galambos, S. Orlov, J. Wilde, W. Aitkenhead, Y-S. Kim, J.Kim, S. Wang, C. Summitt, Y. Takashima, "Novel 3D Differential Phase Contrast Imaging System", Collaborative Conference on 3D and Materials Research (CC3DMR) 2016, Seul, South Korea, (June 2016)

349. L. Hesselink, IWH Symposium, Japan, Keynote presentation March 2022

350. L. Hesselink, MITAB Keynote talk, Reducing CO2 Emissions by 50% from 2005 Levels

351. L. Hesselink, Dielectrophoretic Single Bead-Droplet Reactor (SBDR): An Approach Towards High-Fidelity Solid-Phase DNA Synthesis, ENGE 2022, Plenary Presentation, November 2022, Korea

352. L. Hesselink, JENA Plenary Presentation, A Purposeful Conversation: Scalable Laboratory Experimentation using iLabs: The Digital Twin for Laboratories, November 2022

353. Shape Optimization of Electrostatic Ion Beam Systems with a 3D Adjoint Boundary Element Method, L.T. Neustock, L. Hesselink at EIPBN (The 65th International Conference on Electron, Ion and Photon Beam Technology and Nanofabrication) New Orleans, LA, May 31-Jun 3, 2022

CONTRIBUTED TALKS: (93-05) 1981-1992 AVAILABLE ON REQUEST. PARTIAL LIST

1. Hesselink, L., "Volumetric Hologram Storage," AFOSR/NC, Organic/Polymeric Photorefractive Materials Workshop, Thousand Oaks, CA July 22, 1994.

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