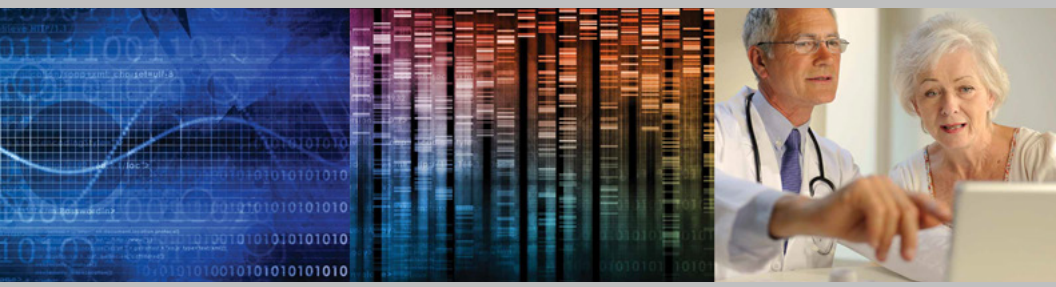
An Introduction to the National Biomarker Development Alliance (NBDA)



January 13, 2014

10:00 a.m. – 12 noon EST

National Press Club
Holeman Lounge
529 14th Street, NW
Washington, DC 20045

NBDA National Biomarker Development Alliance

ACKNOWLEDGEMENTS

"Never doubt that a small group of thoughtful, committed citizens can change the world. Indeed, it is the only thing that ever has."
— Margaret Mead

We (the NBDA Management Team) and advisors express our sincere appreciation and thanks to the following organizations, groups, and individuals for their funding, advice, and ongoing belief in Margaret Mead's famous truth:

- The Arizona State University (ASU) Office of the President and the Arizona State University Foundation. Special thanks to Dr. Michael Crow, who does believe "big ideas" will always find a way and provided startup funding for the NBDA. To Dr. Rick Shangraw, Director of the ASU Foundation, our appreciation for all that you did to make the NBDA a reality.
- Drs. Jack Jewett and Bill Read and the Flinn Foundation. Your startup support is visionary and appreciated.
- Dr. Judy Mohraz, CEO, President and Trustee, Virginia G. Piper Charitable Trust. Our heartfelt thanks for supporting the NBDA Workshops – enabling knowledge networks.
- So many great biomarker scientists at ASU: Specifically, Drs. Ray Dubois, Josh LaBaer, Randy Nelson, Karen Anderson, Ariel Anbar, and others – substantial knowledge, willingly shared.
- Drs. Bob Penny (International Genome Consortium), Martha Brumfield (Critical Path Institute), Jeff Trent and Michael Berens, (Translational Genomics), and Dr. Rafael Fonseca (Mayo Clinic) for your support, wise council, and unselfish commitment to the formation of the NBDA.
- So many of our scientific and clinical colleagues who have joined us in workshops and think tanks to identify the pervasive problems in biomarker development and work together to envision and implement solutions.
- Drs. Laura Esserman, Don Berry, Laura van't Veer, Nola Hylton, and the ISPY-2 team – together we hope to transform biomarker development - for the better.
- Janet Woodcock. Her commitment to innovation and dedication to delivering more effective interventions to patients inspire and motivate us all. And to Liz Mansfield, who has represented the FDA on the biomarker front so well for so long.
- Our industry colleagues who suffer the consequences of failed biomarkers. A special thanks to those that have participated in the NBDA workshops.
- Mara Aspinall, CEO of Ventana Health Systems, for her encouragement and unabashed belief in the field of diagnostics, and for DxInsights.
- Clifton Leaf, a survivor who does his "homework" and with his must read new book, exemplifies what one committed individual can do to change the world.
- All of those who dedicate themselves to improving the lives of patients (be it cancer, Alzheimer's, diabetes, cardiovascular disease – and the list of urgent and unmet needs goes on) who inspire and ask us only that we all do what it takes to move scientific advances to patients more effectively (and hopefully faster), which are reasonable expectations.

AGENDA

- **Why the NBDA - Why Now: Our Audacious Vision to Transform Biomarker Development**
  Anna D. Barker, Ph.D.
  President and Director, NBDA

- **Sorry State of Biomarker Development: NBDA's Convergence Model to Deal With a Little-Understood Crisis**
  George Poste, D.V.M., Ph.D.
  Interim Chief Science Officer, NBDA

- **Standards at Every Step: The Foundation of Quality, Consistency, and Reproducibility**
  Carolyn Compton, M.D., Ph.D.
  Chief Medical Officer, NBDA

- **Achieving the Possible but not Simple Vision for Precision Medicine: Role of the NBDA**
  Steven D. Averbuch, M.D.
  Vice President, Translational Clinical Development and Pharmacodiagnostics, Bristol-Myers Squibb Company

- **ISPY-2 and the NBDA: Fit-for-Purpose Biomarkers Get the Right Drugs to the Right Patients Faster**
  Laura Jean Esserman, M.D., M.B.A.
  Director, Carol Franc Buck Breast Care Center: Professor, Surgery and Radiology, University of California, San Francisco (Co-Principal Investigator, ISPY-2 and ISPY-3)

- **Qualifying Biomarkers for Regulatory Use**
  Janet Woodcock, M.D.
  Director, Center for Drug Evaluation and Research, U.S. Food and Drug Administration

- **Why Biomarkers Are the Only Way Forward in the Cancer Fight**
  Clifton Leaf, M.F.A.
  Assistant Managing Editor, Fortune Magazine
  Author, "The Truth in Small Doses: Why We're Losing the War on Cancer—and How to Win It"

- **Question-and-Answer Period**

SPEAKERS

Anna Barker, Ph.D.
President and Director, National Biomarker Development Alliance
Co-Director, Complex Adaptive Systems; Professor, School of Life Sciences, Arizona State University

As the director and president of the NBDA, Dr. Barker leads strategic planning, staffing, program development, and implementation. She works closely with the management team, advisors, external experts, and other stakeholders to define the scope of targeted scientific and education projects and to achieve the mission of the NBDA.

She is Co-Director of Complex Adaptive Systems at ASU, which serves as an organizing construct to understand and solve multidimensional problems in the biological and social sciences, such as represented by the NBDA. In this role, she directs efforts to develop transformative knowledge networks that leverage convergent knowledge, innovative teams, and novel funding approaches to better prevent and treat acute and chronic diseases. The NBDA employs this model.

Prior to joining ASU, Dr. Barker served as the Deputy Director of the National Cancer Institute (NCI) and as Deputy Director for Strategic Scientific Initiatives for several years, where she developed and implemented multi/trans-disciplinary programs including the Alliance for Nanotechnology in Cancer; The Cancer Genome Atlas (TCGA), in collaboration with the National Human Genome Research Institute; and the Clinical Proteomics Technologies Initiative for Cancer; the Physical Sciences-Oncology Centers – PS-OCs); and major national efforts in biospecimen best practices (CaHUB) and bioinformatics (CaBIG). All of these program emphasize the synergy of large scale and individual initiated research, precompetitive research, public databases and clinical to more effectively detect, prevent, and treat cancer. She also oversaw the NCI's international cancer research programs, including pilot programs in Latin America and China.

In the biomarker area, Dr. Barker was the founding co-chair of the NCI-FDA Interagency Task Force; founding co-chair of the Cancer Steering Committee of the FNIH Biomarker Consortium; and the founding director of the National Biomarker Development Alliance (NBDA). Dr. Barker has a long history in research and the leadership and management of research and development in the academic, nonprofit and private sectors. She served as a senior scientist and

subsequently as a senior executive at Battelle Memorial Institute for 18 years; and co-founded and served as the CEO of a public biotechnology drug development company. She has received a number of awards for her work in support of cancer research, cancer patients, professional and advocacy organizations, and the ongoing national effort to prevent and cure cancer. Her research interests include biomarker discovery and development, complex adaptive systems science, and free-radical biochemistry in cancer etiology and treatment. Dr. Barker completed her M.A. and Ph.D. degrees at The Ohio State University, where she trained in immunology and microbiology.

George Poste, D.V.M, Ph.D.

Interim Chief Science Officer, National Biomarker Development Alliance
Co-Director, Complex Adaptive Systems
Regents' Professor and Del E. Webb Chair in Health Innovation, Arizona State University

Dr. Poste serves as the interim chief science officer for the NBDA. In this role, through the NBDA's think tanks and workshops and literature and other sources, he works closely with the Alliance team to identify and prioritize key barriers in the discovery and development modules of biomarker development. He also creates networks among relevant stakeholders to plan and implement solution strategies for the barriers identified.

Dr. Poste is Regents' Professor and Del E. Webb Chair of Health Innovation at Arizona State University. He founded and built the Biodesign Institute at ASU and served as its Director from 2003 to 2009. In 2009 he launched the Complex Adaptive Systems (CAS) at ASU which integrates research across disciplines to study the altered regulation of molecular networks in human diseases to provide a contemporary basis for the development of targeted disease interventions, inclusive of remote monitoring of health status using miniaturized body sensors and mobile devices.

Dr. Poste is a Fellow of the U.K. Royal Society, the Royal College of Pathologists, and the U.K. Academy of Medicine, a Distinguished Fellow at the Hoover Institution, Stanford University, a member of the Council on Foreign Relations, and the U.S. Institute of Medicine Board on Global Health. He has served as a member of the Defense Science Board of the U.S. Department of Defense and currently serves on advisory committees for several U.S. government agencies in defense, intelligence, national security, and health care. He has published extensively on pharmaceutical technologies, cancer, and infectious diseases. He

was honored in 1999 by Her Majesty, Queen Elizabeth II, as a Commander of the British Empire for his contributions to international health care and security. He serves on the Board of Directors of Monsanto, Exelixis, Caris Life Sciences, and the Scientific Advisory Boards of Burrill and Company and Synthetic Genomics. From 1992 to 1999, he was Chief Science and Technology Officer and President, R&D, of SmithKline Beecham (SB), where he was associated with the registration of 31 drug, vaccine, and diagnostic products. He has received a number of awards including Scientist of the Year by R&D Magazine; the Einstein Award from the Global Business Leadership Council, 2006; and the Scrip Lifetime Achievement Award, 2009.

Carolyn Compton, M.D., Ph.D.

Chief Medical Officer, National Biomarker Development Alliance
Professor, School of Life Sciences
Arizona State University

As chief medical officer of the NBDA, Dr. Compton works closely with trans-sector external experts on all phases of specific network-enabled projects to address major barriers in the biomarker development process. In this role she plans and implements consensus conferences, and prioritizes and integrates existing guidelines, best practice, and other standards to identify targeted needs for demonstration projects and new research. She also leads the NBDA's programs in biospecimens and biorepositories and implements specific programs that include clinical trials.

Dr. Compton is a nationally prominent academic pathologist specializing in gastrointestinal disease and is board certified in both anatomic and clinical pathology. She is a Professor at Arizona State University and an Adjunct Professor of Pathology at both the University of Arizona and Johns Hopkins. At ASU she is on the faculty of the School of Life Sciences, and at Mayo Clinic, she is a Research Affiliate in the Department of Pathology and Laboratory Medicine.

She is a member of the Biodesign Institute, and the Complex Adaptive Systems Initiative. She is a former Professor of Pathology at Harvard Medical School, Chief of Gastrointestinal Pathology at Massachusetts General Hospital, and Pathologist-in-Chief of the Boston Shriners Children's Hospital. More recently she has served as the CEO and President of the Critical Path Institute (2012), the Director of Biorepositories and Biospecimen Research and the Innovative Molecular Analysis Technologies program at the National Cancer Institute (2005-2011), and the Strathcona Professor and Chair of the Department of Pathology at

McGill University and Pathologist-in-Chief of the McGill University Health Center (2000-2005). She is the immediate past Chair of the American Joint Committee on Cancer (AJCC) and the Chair of the Precision Medicine Core of the AJCC. She has authored more than 500 scientific manuscripts, review articles, books, and chapters. Dr. Compton received her M.D. and Ph.D. degrees from Harvard University

Steven D. Averbuch, M.D.

Vice President, Translational Clinical Development & Pharmacodiagnostics
Bristol-Myers Squibb Company

Dr. Averbuch is currently Vice President, Translational Clinical Development & Pharmacodiagnostics, Bristol-Myers Squibb Company based in Lawrenceville, NJ, USA. In this role, he serves as the Executive Sponsor of the Translational R&D teams across the Full Development and Life Cycle Management pipeline. He also leads the Pharmacodiagnostics Center of Excellence with its mission to drive biomarker strategy, optimize biomarker knowledge and tools across all of R&D, and execute the integrated co-development and co-commercialization of diagnostic tests as companions to BMS products.

Dr. Averbuch joined BMS in 2006. Previously he co-led the oncology early strategy team and he was the executive sponsor for Oncology Transition Teams for the execution of Phase II oncology programs. He has made significant Global Clinical Research contributions to business development and he has participated in seven successful acquisitions.

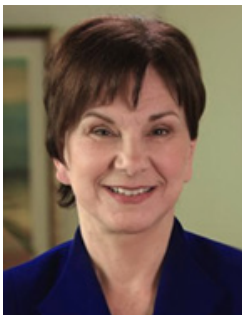
He previously held positions at Merck Research Laboratories, AstraZeneca, and Mount Sinai School of Medicine. He received his M.D. degree and internal medicine training from the University of Illinois, Chicago, and his Medical Oncology training at the National Cancer Institute in Bethesda, Maryland.

Dr. Averbuch has authored over 60 peer-reviewed publications and book chapters and is a coauthor on one patent. He is currently on the Personalized Medicine Coalition Board of Directors, the Advisory Board for the University of Kansas Institute for Advancing Medical Innovation, and a member of the American Society of Clinical Oncology and the American Association for Cancer Research, having served on multiple committees for both organizations.

Laura Jean Esserman, M.D., M.B.A.
Director, Carol Franc Buck Breast Care Center
Professor of Surgery and Radiology,
University of California, San Francisco

Dr. Esserman is a surgeon and breast cancer oncology specialist, and is the Director of the Carol Franc Buck Breast Care Center at the University of California, San Francisco (UCSF). In 1996, she started the Center of Excellence for Breast Cancer Care to integrate clinical care and research, automate tools for the capture of patient and clinical data, and develop systems to tailor care to biology, patient preference, and performance. She is a nationally and internationally recognized leader in the field of breast cancer and has published over 200 peer-reviewed publications.

Dr. Esserman is the Principal Investigator of the I-SPY TRIAL program, a multisite neoadjuvant standing Phase II adaptive clinical trial that has evolved into a model for translational research, the development of companion diagnostics, and innovation in clinical trial design. Dr. Esserman launched a University of California-wide breast cancer initiative called the Athena Breast Health Network, designed to follow 150,000 women from screening through treatment and outcomes, incorporating the latest in molecular testing and Web-based tools into the course of care. Athena is now launching a large demonstration project to optimize risk-based screening. She served as a member of President Obama's council of advisors on science and technology (PCAST) Working Group on Advancing Innovation in Drug Development and Evaluation, which is exploring ways that the Federal government can optimize support for science-based innovation in drug development and regulatory evaluation processes. Dr. Esserman received her A.B. degree from Harvard University, and her M.D. and M.B.A. degrees from Stanford University.



Janet Woodcock, M.D.
Director, Center for Drug Evaluation and Research
U.S. Food and Drug Administration

Dr. Woodcock joined the U.S. Food and Drug Administration (FDA) in 1986, assuming the leadership of the Center for Drug Evaluation and Research (CDER) in May 1994. Prior to joining CDER, she served as Acting Deputy Center Director of the Center for Biologics Evaluation and Research (1990-1992) and Director of the Office of Therapeutics Research and Review (1992-1994), where she oversaw approval of the first biotechnology-based treatments for multiple sclerosis and cystic fibrosis. From 2004 to 2008, Dr. Woodcock provided support to FDA's Commissioner, serving as Deputy Commissioner and Chief Medical Officer, Deputy Commissioner for Operations, and Chief Operating Officer, overseeing various aspects of scientific and regulatory operations.

During her tenure at FDA, Dr. Woodcock's achievements have been substantial. Under her leadership, CDER has streamlined review processes for new and generic drugs while improving standards for quality, safety, and effectiveness. The processes for submitting marketing applications and adverse events reports and for reviewing submissions in FDA have been automated. CDER's regulatory decision-making processes also have been streamlined, making decisions more open and transparent. CDER's regulatory procedures and policies are publicly available — scores of technical guidance describing FDA's thinking on regulatory standards have been issued. Many CDER processes are carried out with an unprecedented degree of participation on the part of consumer and patient representatives. An extensive CDER Web site hosts a myriad of helpful information on drug approvals, safety issues, and other critical information targeting consumers, patients, health care practitioners, regulated industry, and other audiences.

Highlights of select recent accomplishments include negotiating the 2012 Generic Drugs User Fee Act, which will speed access to safe and effective generic drugs to the public and reduce costs to industry and renegotiating the Prescription Drug User Fee Act (PDUFA V) to support timely evaluation and approval of prescription drugs.

In 2011 and 2012, Dr. Woodcock launched multiple efforts to support development of new therapies for rare and neglected diseases, molecularly defined disease subgroups, and new antibacterial therapies. She oversaw the implementation

of innovative policies to foster adaptive trial designs (2010) and trial enrichment strategies (2012) and encourage the qualification of new drug development tools (2010) to help speed drug development and evaluation.

Following enactment in March 2010 of the Patient Protection and Affordable Care Act (Affordable Care Act), Dr. Woodcock developed and launched the biosimilars effort to create an abbreviated licensure pathway for biological products; she then negotiated the Biosimilar User Fee Act of 2012 (BsUFA) to support approval using this new pathway.

Dr. Woodcock continues to lead FDA's Pharmaceutical Quality for the 21st Century initiative to modernize pharmaceutical manufacturing and the Safe Use/Safety First initiatives, which are critical to drug safety throughout the drug lifecycle and ensuring frequent and clear communications to the public about the risks and benefits of drugs.

As Acting Deputy Commissioner for Operations, in 2004, Dr. Woodcock began the Critical Path Initiative, which continues to encourage and foster the development of new and better tools to support medical product research so that drug, device, and biologics development is more predictable and more informative. As Deputy Commissioner and Chief Medical Officer, Dr. Woodcock launched the Sentinel Initiative with the goal of building a new active surveillance system to augment FDA's existing adverse events monitoring systems.

As Director of CDER, Dr. Woodcock maintains contact with a variety of diverse constituencies, including the clinical and scientific communities, members of Congress and the Administration, patient and consumer advocacy groups, the international drug regulatory community, regulated industry, and representatives of Federal and State agencies. She frequently appears in or is quoted by the national media and has testified repeatedly before Congress.

Dr. Woodcock has earned numerous awards, most recently the Arthritis Foundation's Floyd B. Odlum Making a Difference Award and the Luminary Award from the Personalized Medicine World Conference. She has been the recipient of the Presidential Rank Meritorious Executive Award and three HHS Secretary's Distinguished Service Awards among many others. She has authored more than 60 publications. Dr. Woodcock received her M.D. degree from Northwestern University Medical School in 1977, following an undergraduate degree in chemistry from Bucknell University. She has held teaching appointments at Pennsylvania State University and the University of California at San Francisco. Dr. Woodcock lives in Maryland with her husband and is the mother of two daughters.

Clifton Leaf, M.F.A.
Assistant Managing Editor, Fortune Magazine
Author, "The Truth in Small Doses: Why We're Losing the War on Cancer—and How to Win It"

Mr. Leaf, an assistant managing editor at *Fortune* magazine, is the author of The Truth in Small Doses: Why We're Losing the War on Cancer—and How to Win It, published by Simon & Schuster last summer. A winner of the Gerald Loeb Award for Distinguished Business and Financial Journalism and a two-time finalist for the National Magazine Award, Mr. Leaf was until recently a guest editor for *The New York Times* op-ed page and Sunday Review. Previously, he was executive editor at *The Wall Street Journal's SmartMoney* magazine and, prior to that, executive editor at *Fortune*, where he also wrote a number of prominent feature articles.

It was after one such writing assignment, a 2004 *Fortune* cover story entitled "Why We're Losing the War on Cancer (and How to Win It)," that he began working to change the way the global cancer fight is funded and pursued, pushing for ways to speed up progress against the disease. A keynote or featured speaker at some 30 scientific conferences around the world, Mr. Leaf has presented testimony to the President's Cancer Panel three times, given a plenary address at the annual meeting of the American Association for Cancer Research, and delivered "Grand Rounds" at the National Cancer Institute.

A recipient of the Henry R. Luce Award for public service, the NIHCM's Health Care Journalism Award, and several leadership awards from leading patient organizations, Mr. Leaf has been a moderator or panelist in numerous cancer-related meetings, including three Capitol Hill briefings for members of Congress. For three years, he also served on the national board of directors for Susan G. Komen for the Cure, the world's largest breast cancer charity. Prior to joining *Fortune* in 2000, he was an editor and writer for a number of national magazines. A graduate of Williams College, he later received a master of fine arts degree in writing from Sarah Lawrence College. He lives in Brooklyn, New York.

Robert Mittman, M.S.
(Facilitation)
Founder, Founder, Facilitation | Foresight | Strategy; Director, Biomedical Strategy & Knowledge Development, Complex Adaptive Systems Professor of Practice, School of Biological and Health Systems Engineering and the School of Computing, Informatics, and Decision Systems Engineering in the Ira A. Fulton Schools of Engineering, Arizona State University

As founder of Facilitation, Foresight, Strategy, Robert Mittman works with groups of organizations to discover and implement shared approaches to complex and intractable problems. He engages audiences in a lively exchange of perspectives to turn simple meetings into forums that allow diverse individuals to work productively together.

Robert specializes as a scientific strategist. He helps large groups of scientists from diverse disciplines articulate shared areas of interest, frame significant and innovative research questions, and identify opportunities for new partnerships and collaborations to advance the development of new fields of science.

Robert facilitates strategic thinking with non-profit health organizations, government agencies, and the for-profit health care industry, including the National Cancer Institute; the Centers for Disease Control and Prevention, the American Association for Cancer Research; the University of California, San Francisco's School of Medicine; Health Level 7; the Leukemia and Lymphoma Society; the Angiogenesis Foundation; the California HealthCare Foundation; Johnson and Johnson; Ascension Health; and Kaiser-Permanente. Recent work has included integrating the disciplines of biophysics, physical chemistry, and mathematics into biological research; developing a vision of how information technology can improve quality and safety in a range of health care settings from research to the clinic to the home; and crafting a vision for personalized health care.

For nearly two decades, Robert provided strategic advice to health care organizations as director at Institute for the Future. Robert holds graduate degrees in computer science and public policy analysis, and a Bachelor of Science degree in electrical engineering, all from the University of California at Berkeley.