

**Jason Pyle, MD, PhD**

Chief Executive Officer

Dr. Pyle was formerly Chief Technical Officer and co-founder of Epoc, Inc., a privately held medical engineering company. Dr. Pyle holds an appointment as adjunct professor of bioengineering at Vanderbilt University where he has worked to develop cross-disciplinary programs of biological and engineering research. As the co-founder and Chief Technical Officer of Pria Diagnostics, Dr. Pyle was named Innovator of the Year (2006) by Frost and Sullivan. Dr. Pyle holds numerous pending and issued patents in the engineering and biological sciences and has worked in diverse cross-discipline areas such as nanofabrication, optical engineering, and structural biology.

In addition to his broad technical abilities, Dr. Pyle has established numerous corporate partnerships between small technical companies and some of the world's largest corporations. He has directly supervised and coordinated both business development and operational activities within large co-development partnerships. Dr. Pyle has worked in finance, technical and manufacturing transactions in Singapore, Japan, and China. His post-doctoral research focused on the large-scale expression and control of neural proteins. He holds a Ph.D. in Molecular and Cellular Physiology and an M.D. from Stanford University. He received degrees in optical engineering and physics from the University of Arizona.

**Cynthia (C.J.) Warner**

President

Cynthia (C.J.) Warner joined Sapphire Energy in February 2009 as President. She brings more than 27 years of experience in the energy, refining and transportation industries. At Sapphire Energy, Ms. Warner is tasked with driving the company's initiative to transition technology trials and research into commercial-scale crude oil operations. Using only sunlight, CO<sub>2</sub> and non-potable water, Sapphire Energy's production of Green Crude is the environmental and economically wiser renewable option for replacing petro-based gasoline, diesel and jet fuel.

A chemical engineer by training and one of the very few senior women in the oil and gas industry, Ms. Warner served as an executive with energy industry giants British Petroleum, Amoco Oil Company and UOP. Prior to joining Sapphire, she most recently served as Group Vice President, Global Refining for BP where she was instrumental in turning around BP's US refining business and achieving record performance in International refining. During her 10-year career with BP she held numerous leadership roles including overseeing refining operations in five continents and developing long-term technology strategies for low carbon and sustainable fuels. Ms. Warner led the groundbreaking cooperative effort with the US EPA to shape a framework for Clean Air improvements which was eventually signed on by the entire US Refining industry.

Ms. Warner began her career at UOP where she had significant hands-on experience learning refining process operations. That was followed by several years at Amoco where she held key operational leadership roles. She is a featured leader in the 2008 book 'Becoming a Resonant Leader: Develop Your Emotional Intelligence' (Harvard Business School Press).

Ms. Warner has a BS degree in Chemical Engineering from Vanderbilt University and an MBA from Illinois Institute of Technology. She is married with two children.

## **Mike Mendez**

### **Vice President of Technology**

Mr. Mendez has held a number of top industry positions at the forefront of the molecular biology revolution. In addition to serving as Director of Bioengineering at GenWay, Mr. Mendez was also associate director of Exploratory Research at Syrrx, Inc. (presently Takeda Pharmaceuticals). There he established a new department that focused on novel platforms for over-expression, purification, and crystallization of membrane proteins. Mr. Mendez co-founded and led the technical program at MemRx, a structural biology company that focused on the structure determination of membrane proteins, specifically GPCRs. Mr. Mendez is widely regarded as one of the lead pioneers in the development of fully human antibodies and is the lead author and co-inventor of the Xenomouse platform technology that formed Abgenix, Inc., most recently acquired by Amgen for \$2.2 billion. He created all the viral vectors for the Cell Genesys Platform technology, GVAX. Mr. Mendez has served as a genetic consultant and scientific adviser for numerous biotech and academic institutions, including Geron Corporation, Gentrol, Inc., Expression Systems, Aliva, Inc., and the California Institute of Technology. He is also the founder and principal scientist of Gryffin Consulting, Inc., a genetic engineering consulting firm specializing in the areas of gene therapy and antibody and membrane protein production.

## **Brian Goodall, PhD**

### **Vice President of Downstream Technology**

Dr. Goodall's career has spanned three decades in the petrochemical, materials and energy industries. An expert in all areas of catalysis, his commercial successes include the catalyst used to make 40% of the world's polypropylene. He has worked for Royal Dutch Shell, BFGoodrich, Albemarle, Rohm and Haas Company, and, most recently, Imperium Renewables, where his team recently delivered the 1000 gallons of biojet fuel used on Virgin Atlantic's first-ever commercial "green" jet flight. He is a corporate honoree at the National Inventors Hall of Fame, and is responsible for over 80 patents, 60 papers, countless academic collaborations, and winning \$20 million in federal funding in the last decade. He holds a Ph.D. in Inorganic and Organometallic Chemistry from the University of Bristol, UK.

## **Alex Aravanis, MD, PhD**

Senior Director of BioEngineering

Dr. Aravanis has over ten years of R&D experience developing products at the interface of engineering and biology. He was a pioneer in developing the first biological applications of micro-electromechanical systems (MEMS), microfluidics, and polymer optics. He has held R&D positions at Stanford University, Hewlett Packard, Lawrence Berkeley Laboratories, and Pria Diagnostics, where he was a co-founder and the Vice President of Engineering. While there, he led the R&D team that developed Pria's disposable diagnostic system, which has been licensed world-wide.

Dr. Aravanis received his M.D. and Ph.D. in Electrical Engineering from Stanford University where he was a fellow of the Helen Hay Whitney Foundation, the Walter V. and Idun B. Berry Foundation, the National Science Foundation, Stanford University, and the NIH. He has authored numerous peer-reviewed journal articles and conference proceedings, is an inventor on issued and pending patents, and has presented his work in seminars at Stanford University, UC Berkeley, MIT, Oxford, and The Society for Neuroscience.

## **Tim Zenk**

Vice President of Corporate Affairs

Tim Zenk has spent much of his distinguished career shaping public policy – in helping leaders become better leaders and the public become more educated about key issues impacting the nation and the globe. His more than 20 years of rich experience has taken him from the front lines of Washington D.C., to the back roads of the Middle East, and to rural areas working on big issues in small towns. His passion is apparent and his experience varied. Most recently, as executive vice president for Edelman, an international communications firm, he built and led numerous campaigns, organized public-private partnerships, and counseled energy, biotech and technology leaders. Some clients included Louis Dreyfus Commodities, NorthernStar Natural Gas, Fate Therapeutics and Ikaria. Prior to that, he was founder and vice president of Chameleon Technology, a venture funded cutting-edge leader in wireless infrastructures. He also was a top executive for Telecommunications Systems (NYSE - TSYS), a leading provider of mission critical wireless data systems for wireless carriers, governments and intelligence organizations.

Tim is known nationally for his political acumen, particularly regarding his work on key campaigns ranging from gubernatorial to congressional to presidential. His global work for the Clinton/Gore administration has left him with professional and life experiences that will last forever. Today, his passion for legacy energy solutions are top on his agenda and he is working to help Sapphire be the foremost leader in solving one of today's biggest environmental, economic and political quandaries – energy dependence.

Tim is married with one child. He is an avid fisherman and science junkie. His favorite channel is sci-fi where he frequently gets confused as to whether the aliens are real or not.

## **Peter Attia**

Senior Director of Business Development & Corporate Strategy

Peter Attia comes to Sapphire Energy from McKinsey & Co., where he was a consultant in the Palo Alto office as a member of the corporate risk practice and healthcare practice. Prior to arriving at McKinsey, Mr. Attia spent 5 years at the Johns Hopkins Hospital in Baltimore, Maryland as a general surgery resident, where he was the recipient of several prestigious awards. He also spent 2 years at the National Institutes of Health, in Bethesda, Maryland as a surgical oncology fellow. The author of numerous medical and research papers, he holds a M.D. from Stanford University and a B.Sc. in Mechanical Engineering and Mathematics from Queen's University in Kingston, Ontario, Canada.

## **Stephen Mayfield, PhD**

Chairman, Scientific Advisory Board

Stephen Mayfield is a Professor of Cell Biology, and Associate Dean of the graduate school at The Scripps Research Institute (TSRI), where he has been a faculty member since 1987. His research focuses on the molecular genetic analysis of gene expression in the green algae *Chlamydomonas reinhardtii*, and on the recombinant production of therapeutic protein and biofuel molecules using algae as a production platform. As an assistant professor at Scripps Research Institute, Dr. Mayfield was the first person to achieve transformation of the *C. reinhardtii* nuclear genome, work that allowed this organism to become the dominant genetic organism for the study of photosynthesis and chloroplast function.

Over the last ten years, Dr. Mayfield's lab has identified mechanisms of chloroplast gene expression, shown that redox regulation is a dominant mechanism for chloroplast gene expression, and identified chloroplast protein disulfide isomerase as the molecular entity used for redox regulation in chloroplasts. These basic studies on chloroplast gene expression enabled the Mayfield lab to be the first to show high levels of recombinant protein expression in the algal chloroplast. This set the stage for the use of algae as a platform for therapeutic protein production, including the expression of a human monoclonal antibody. These studies resulted in the founding of Rincon Pharmaceutical, a startup company based on the low cost production of human therapeutics using eukaryotic algae as an expression platform. Recent studies in the lab have determined the three-dimensional structure of both the 80S and 70S ribosomes of *C. reinhardtii* using cryo-electron microscopy, and shown that the chloroplast ribosome contains novel structural domains used for translational regulation. These studies have redefined knowledge of the basic rules of gene expression in algae, and will help illuminate key aspects of gene expression essential to developing algae as a source of renewal bioenergy.

## **Michael Burkart, PhD**

Scientific Advisory Board

Dr. Burkart is Assistant Professor, Chemistry and Biochemistry Tumor Growth, at UCSD, where he is investigating an enzyme-based approach for the study of biosynthetic enzymes used to

produce natural product antibiotics of terrestrial and marine origin. Using techniques recently developed in his laboratory to identify and isolate modular synthase proteins from culture, they study the enzymes that produce a series of antitumor natural products. The tools they are providing will aid in the elucidation, discovery, and production of these natural products. Additionally, he and his team are actively participating in the organic synthesis and derivatization of antitumor compounds. This research has a two-fold purpose. One is to critically establish secondary biosynthetic pathways of individual enzyme systems through interaction with precursors and derivatives of antitumor molecules. The second purpose will assess the relevance of these molecules as improved therapeutics.

## **C. Dale Poulter, PhD**

### Scientific Advisory Board

Currently Distinguished Professor of Chemistry at the University of Utah, Dale Poulter focuses his research on the interface between chemistry and biology. His current work studies enzymes in the isoprenoid biosynthetic pathway and the pathways that catalyze activation and bond-forming reactions. A Fellow of the American Academy of Arts and Sciences, Dr. Poulter is the author of countless papers and the recipient of many awards, among them the James Flack Norris Award and the Repligen Award from the American Chemical Society, the Rosenblatt Prize from the University of Utah, the NIH Merit Award, and the Governor's Medal for Science and Technology.

Dr. Poulter also serves as Editor-in-Chief of the *Journal of Organic Chemistry*, and has been on the editorial advisory boards of *Chemical Reviews*, *Bioorganic & Medicinal Chemistry*, and the *Journal of the American Chemical Society*. Not merely a sought-after lecturer and academician, Dr. Poulter was also a founding scientist of Acacia Biosciences, Inc., and Echelon Biosciences, Inc., both drug discovery companies.

## **Steve Briggs, PhD**

### Collaborator

Dr. Briggs is currently a professor of Section of Cell and Developmental Biology at the University of California, San Diego. A member of the National Academy of Sciences, Dr. Briggs has an acclaimed history as an innovator in the field of plant genomics. Dr. Briggs was the first person to isolate and characterize a plant gene for resistance to infectious disease, as well as the first to discover a natural mechanism for plant resistance to infection. He also invented the first reverse genetics technology for plants, which is still widely used in maize research, and was the first to use artificial transcription factors to regulate endogenous genes in plants.

In 1998, Dr. Briggs founded the Torrey Mesa Research Institute (originally as the Novartis Agricultural Discovery Institute). As President and CEO of TMRI, he led the team that produced a draft sequence of the rice genome, which provided a framework for genomics in all other grass crops (maize, wheat, barley, oats, rye, and sugarcane). Under his direction, TMRI created the first plant (Arabidopsis) GeneChip, the first reverse genetics technology for Arabidopsis, the first crop GeneChip (for rice), the first exon GeneChip (for Arabidopsis), and the first large-scale plant proteome (for rice).

His current research explores infectious disease in plants and the regulation of self-renewal and pluripotency in embryonic stem cells. In addition to his many academic accolades, Dr. Briggs has extensive industry experience. As Research Director at Pioneer Hi-Bred International, Dr. Briggs supervised the combined genomics program between Pioneer and DuPont. As Senior Vice President for Corporate Research at Diversa, Dr. Briggs invented the Designed Regulatory Protein (DRP) technology that can regulate any human gene.

Dr. Briggs received his B.S. in botany from the University of Vermont, and his Ph.D. in plant pathology from Michigan State University.

## **Geoffrey Price, PhD**

Collaborator

Currently Professor and Chairman of the Chemical Engineering Department at the University of Tulsa, Dr. Price held a professor position at Louisiana State University for over twenty years. A Fellow of the American Institute of Chemical Engineers and member of the American Chemical Society, Dr. Price shares invaluable expertise about the specific behaviors and functions of hydrocarbon fuel molecules. Dr. Price's research interests are primarily in zeolites and zeolite catalysis. Over the past few years, significant progress has been made in Dr. Price's labs in several areas, including solid-state ion-exchange of zeolites and alkylamine probes of zeolitic cations. Price and his co-workers were the first to identify and describe an important solid-state ion-exchange process that takes place between gallium and zeolitic protons for this class of materials. Dr. Price has also identified some potentially valuable hydrocarbon conversion processes, which occur on the copper-zeolite catalysts. Dr. Price has especially provided expertise and experimental data on the conversion of biologically derived molecules into fuels. He holds a B.S. in Chemical Engineering from Lamar University and a Ph.D. in Chemical Engineering from Rice University.

## **Kristina Burow**

Member, Board of Directors

Kristina Burow is a Principal with ARCH Venture Partners, joining the firm in 2004. She is primarily focused on companies in the life sciences and materials sciences. Ms. Burow joined ARCH from the Novartis BioVenture Fund in San Diego where she was involved in numerous investments in the life science sector. Previously, as an early employee at the Genomics Institute of the Novartis Research Foundation (GNF), she directed Chemistry Operations and was active in Business Development. She was a co-inventor of key technology platforms that formed the core of Kalypsys, a GNF spin-off company. Ms. Burow is on the board of Sapphire Energy and works actively with Ensemble Discovery, Achaogen, Kythera Biopharmaceuticals, Celula, and Accelerator. Ms. Burow holds an M.B.A. from The University of Chicago, an M.A. in Chemistry from Columbia University, and a B.S. in Chemistry from the University of California, Berkeley.

## **Nathaniel David, PhD**

Member, Board of Directors

Nathaniel David, is Chief Science Officer and co-founder of Kythera. As the co-founder of Syrrx (acquired by Takeda for \$270 million in 2005) and Achaogen, he has experience creating and growing innovative biotechnology companies. Dr. David was named one of the Top 100 innovators in the world under 35 (2002) by the MIT Technology Review. He holds numerous pending and issued patents in fields such as nanovolume crystallography, antibiotic resistance, and aesthetic medicine. He sits on the executive board of the College of Letters and Sciences, University of California, Berkeley and is a member of the board of trustees of the UC Foundation. He holds a PhD from UC Berkeley in Molecular and Cellular Biology and an AB in Biology from Harvard College.

## **Steve Goldby**

Member, Board of Directors

Steven Goldby joined Venrock in 2007 after spending nine years as CEO of Venrock-backed materials science company, Symyx Technologies, where he is currently Executive Chairman. Mr. Goldby has served as the CEO of MDL Information Systems, a leading scientific information company, before its sale to Reed Elsevier. Prior to MDL, he held various management positions at Alza Corporation (acquired by Johnson and Johnson), including President of Alza Pharmaceuticals. Mr. Goldby was also President of Dynapol, a specialty chemical company and is a registered patent attorney. Mr. Goldby serves on the board of Intermolecular, Inc. Previously, he served on the boards of Vitae Pharmaceuticals (a Venrock-backed company), Ilypsa (acquired by Amgen), Affymax (acquired by GSK), Scios (acquired by Johnson and Johnson), PeopleSoft (acquired by Oracle), Aspect Development (acquired by Itwo), TGV (acquired by Cisco), One Touch Systems (acquired by Apollo Group), Scientific Software (acquired by Agilent). Mr. Goldby is director of Orecon, Ltd., and Sunesis Pharmaceuticals, and Chairman of Nanosys, Inc.

## **Robert Nelsen**

Member, Board of Directors

Robert Nelsen is a co-founder and a Managing Director of ARCH Venture Partners. He focuses on biotechnology, pharmaceuticals, and nanotechnology. Mr. Nelsen joined ARCH at its founding and has played a significant role in the early sourcing, financing and development of more than thirty companies including Ikaria, Adolor (ADLR), Aviron (AVIR, acquired by Medimmune-MEDI), Caliper Life Sciences (CALP), Illumina (ILMN), Trubion Pharmaceuticals (TRBN), Array BioPharma (ARRY), NetBot, deCODE Genetics (DCGN), Nanosys, Alnylam Pharmaceuticals (ALNY), XenoPort (XNPT), GenVec (GNVC), R2 Technology (acquired by Hologic-HOLX), IDUN Pharmaceuticals (acquired by Pfizer-PFE), Genomica (GNOM, acquired by Exelixis-EXEL), Surface Logix, NeurogesX (NGSX), Classmates.com (acquired by United Online-UNTD), Nura (acquired by Omeros), Kythera Biopharmaceuticals, Elixir Pharmaceuticals, Spaltudaq, VLST, Ensemble Discovery, Accelerator, Apoptos, Fate Therapeutics, Agios Therapeutics, and Everyday Learning.

Mr. Nelsen is a director of Sapphire Energy, Ikaria, Agios, NeurogesX, and Kythera Biopharmaceuticals. He previously served on the boards of Trubion Pharmaceuticals, Surface Logix, NetBot, Everyday Learning, Spaltudaq, Array BioPharma, Caliper Life Sciences, Illumina, R2 Technology, and Classmates.com, among others. He also serves as a director of the Fred Hutchinson Cancer Research Institute. Mr. Nelsen holds an M.B.A. from The University of Chicago and a B.S. in Economics and Biology from the University of Puget Sound.

## **Jason Pyle, MD, PhD**

Board of Directors

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## **Clinton Bybee**

Observer, Board of Directors

Board Observer Clinton Bybee is a co-founder and Managing Director of ARCH Venture Partners. Mr. Bybee concentrates primarily on advanced materials, electronics, semiconductors, photonics, and infrastructure businesses. Mr. Bybee has helped organize and finance numerous companies including MicroOptical Devices (acquired by EMCORE), Cambrios Technologies, Aveso, Innovalight, Intelligent Reasoning Systems (acquired by Photon Dynamics), Sempruis, Nanosys, and Xtera Communications. He is a board member of Impinj, Innovalight, Cambrios Technologies, Xtera Communications, Nitronex and Aveso. Mr. Bybee is an organizing member of the Texas Venture Capital Association and currently serves as its first President. Previously, Mr. Bybee worked with ARCH Development Corporation. He also managed a venture investment fund for the State of Illinois and was a production engineer with Amoco Corporation. Mr. Bybee holds an M.B.A. from the University of Chicago and a B.S. in Engineering from Texas A&M University.