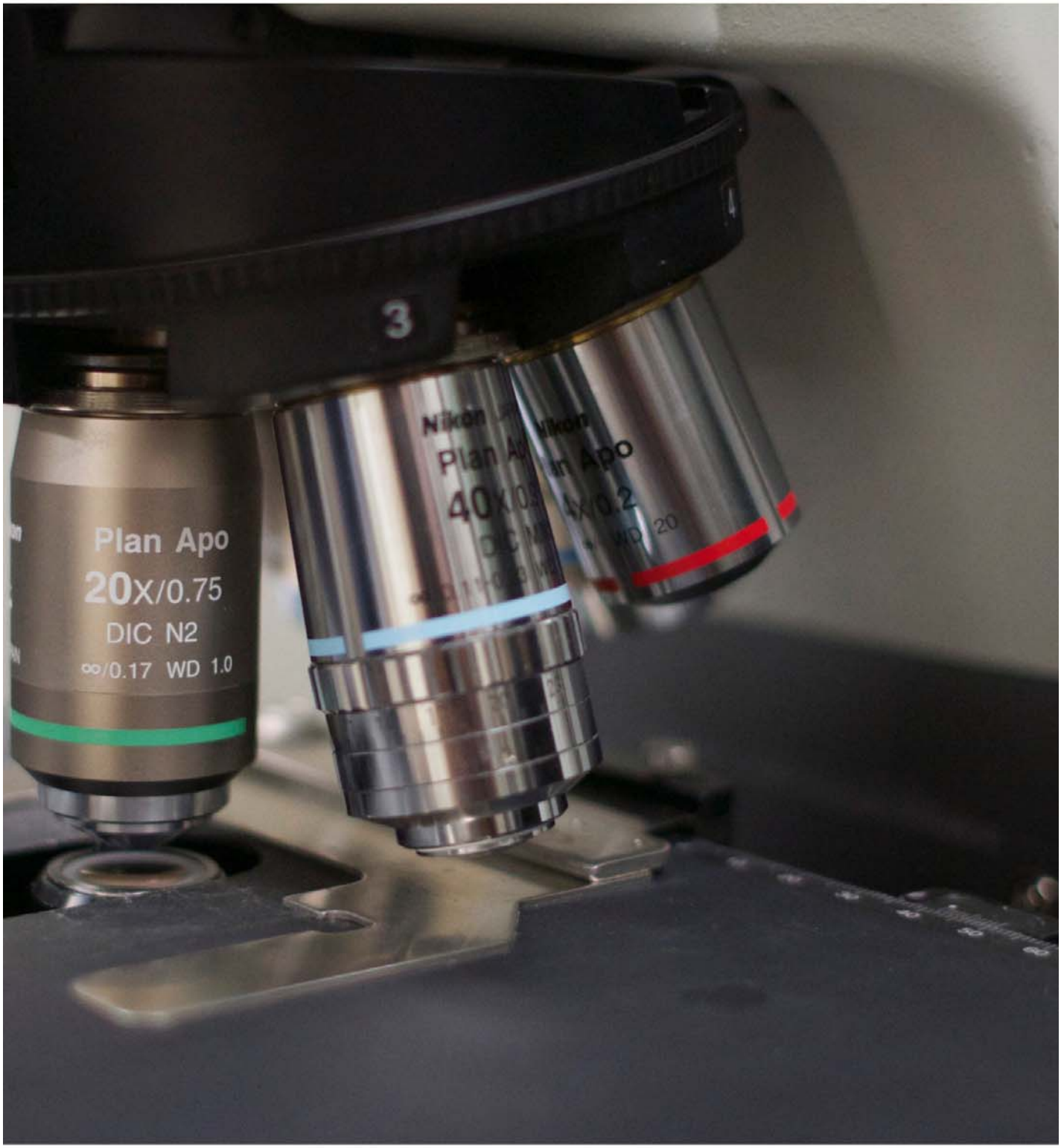
THE GATES CENTER

ANNUAL REPORT 2013

Charles C. Gates Center
for Regenerative Medicine and Stem Cell Biology

UNIVERSITY OF COLORADO **ANSCHUTZ MEDICAL CAMPUS | SCHOOL OF MEDICINE**



Content

Charles C. Gates Center for Regenerative Medicine and Stem Cell Biology

UNIVERSITY OF COLORADO **ANSCHUTZ MEDICAL CAMPUS**

As the cover photo suggests, the Gates Center stepped up both literally and figuratively during the 2013 calendar year. We made great strides in pursuit of the Charles C. Gates family's vision to accelerate scientific discovery from the laboratory to human therapies. The following 2013 Annual Report highlights our recent progress in research, the creation of the Gates Biomanufacturing Facility, recruitment and leadership.

2013 was a seminal year for advancing our vision to establish the Gates Center and the Anschutz Medical Campus as a major player in the fast developing space of regenerative medicine and stem cell therapies. The Gates Center took the lead on all facets of the planning and execution of a much-needed laboratory for the manufacturing of human cellular and gene therapies. The newly named Gates Biomanufacturing Facility is a campus-wide partnership comprised of the Gates Center, School of Medicine, University of Colorado Denver, University of Colorado Health, Children's Hospital Colorado and the Gates Frontiers Fund.

The addition of the Gates Biomanufacturing Facility will bolster the University of Colorado's ability to attract world-class investigators and clinicians in the highly competitive space of regenerative medicine and stem cell therapies. This Annual Report elaborates on some significant recruitments in which the Gates Center has played a major part.

We wish to acknowledge the members of the Gates Center's Community Advisory Board, led by Co-chairs Diane Gates Wallach, Dan Ritchie and Don Elliman, who gave generously of their time, talent and treasure during the past year. We thank them as well as current and future Gates Center supporters who stand ready, willing and inspired to help the Center continue to do everything possible to advance this potentially extraordinary research to meet currently unmet medical needs. We hope the following report will further elaborate on what was achieved by a tremendously dedicated group of people throughout 2013.

Sincerely,

Dennis Roop, PhD

Director, Charles C. Gates Center for Regenerative Medicine and Stem Cell Biology

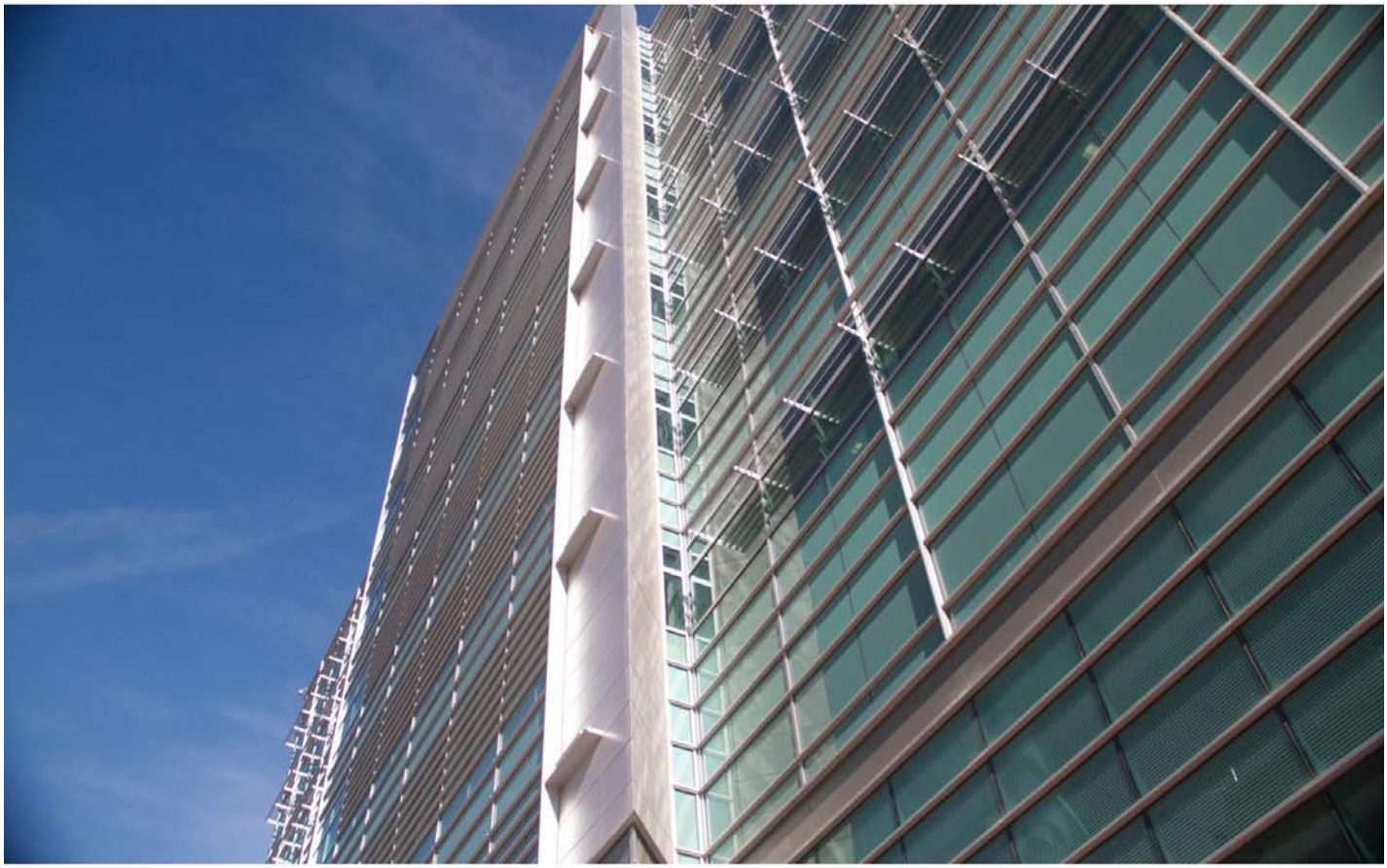
BACK ROW: Tim Gardner, Dan Ritchie, Greg Provenzano, Don Elliman, Kevin Reidy, Tom Payne

FRONT ROW: Diane Gates Wallach, Ann Sperling, Dennis Roop, Patrick Gaines, Jill Cowperthwaite, Heather Callahan, Nancy Thomas

THE VISION

Prior to his death in 2005, Denver industrialist and philanthropist Charles Gates began talking to his family about the hope and benefit stem cell research promised for so many people in the world. Suffering from macular degeneration, Charles Gates started doing research on his own condition only to be introduced to the world of stem cells by his doctor, a family friend. He was amazed to learn about a science that had the potential to be leveraged across many diseases and also allow for personalized therapies. Established in 2006 with a generous gift in his memory, the Charles C. Gates "Program" and now "Center" for Regenerative Medicine and Stem Cell Biology aspires to honor what Charles Gates envisioned—by doing everything possible to support the collaboration between basic scientific researchers and clinical faculty to transition scientific breakthroughs into clinical practice as quickly as possible.

Led by its founding director, Dennis Roop, PhD, who was recruited from the Baylor College of Medicine in January 2007, the Gates Center is now a world-class facility located at the University of Colorado Denver's Anschutz Medical Center, the largest, new biomedical and clinical campus in the United States. Its first-rate laboratories, as well as its ability to conduct on-site clinical trials, are proving to be a successful draw for the nation's top talent in stem cell research. Operating as the only comprehensive Stem Cell Center within a 500 mile radius, the Gates Center also shares its services and resources with an ever-enlarging membership of researchers and clinicians at the Anschutz Medical Campus, which includes University Hospital, Children's Hospital Colorado and the future Veterans Administration Medical Center, as well as the Boulder campus, Colorado State University, the Colorado School of Mines, and business startups. This collaboration is designed to draw on the widest possible array of scientific exploration relevant to stem cell technology focused on the delivery of innovative therapies in Colorado and beyond.



A DISCOVERY THAT CHANGED OUR WORLD

Thanks to a groundbreaking discovery made by a Japanese scientist, Shinya Yamanaka, MD, PhD, in 2006, the major focus of many Gates Center investigators' research is now adult stem cells; as opposed to embryonic stem cells that, despite their potential to generate any cell in the body, have been ethically and politically controversial. Essentially, Dr. Yamanaka discovered that he could reprogram adult skin cells into cells that for all intents and purposes are the same as embryonic stem cells from which they can become anything in the body. Through this reprogramming, the controversy over having to destroy an early fertilized embryo is averted and the potentially serious issue of immune rejection is alleviated. As a result of this amazing discovery, Dr. Yamanaka opened a pathway with tremendous potential for developing new treatments and cures for a myriad of diseases affecting our world. He received the Nobel Prize in Medicine in 2012.

RESEARCH

Pioneering a Humanized Mouse Model for Screening Cancer Drugs

The past year saw the synthesis of a collaborative team comprised of Xiao-Jing Wang, MD, PhD, Yosef Refaeli, PhD, Antonio Jimeno, MD, PhD, and Dennis Roop, PhD, whose early work to decipher the role of cancer stem cells in cancer matured into the discovery of a novel humanized mouse model. Trademarked with the name XactMice, this mouse model functions as a living human "avatar" that mimics each individual patient's immune system and tumor pathology. Dr. Refaeli's patented technique to expand the patient's blood stem cells enables the team to replace the mouse's immune system with each patient's immune system, and thus observe the interaction between a human immune system and the human tumors that are implanted onto the mice. The following quote from the March 23, 2013, issue of Science News leads us to believe we are ahead of the curve:

"The day your local doctor can grow a colony of mice with your immune system and particular ailment is still years away….And at the University of California, Davis, scientists are using such mice to test a new kind of bladder cancer treatment." That treatment is now moving toward human clinical trials."

In fact, Dr. Jimeno is that local doctor, and we are already conducting human clinical trials.

The XactMice model shows great promise for helping treat individual patients and for partnering with pharmaceutical companies to test drugs that attack cancer and other diseases. We are monitoring the progress of two known companies that are performing similar patient-specific tests, both of which seem to be attracting capital and expanding rapidly. We believe our technology has broader market potential.

IMPROVING OUTCOMES AND SURVIVAL RATES AFTER CHEMOTHERAPY AND RADIATION TREATMENT

Chemotherapy and radiation lead to terrible side effects in 40 to 70% of cancer and bone marrow transplant patients. A condition called mucositis results in oral lesions that cause disabling pain and can lead to disruptions in care and sometimes death. Currently, there is only one FDA approved drug for patients receiving radiation treatment prior to bone marrow transplants, but there are no approved drugs that prevent mucositis in cancer patients. Drs. Yosef Refaeli and Xiao-Jing Wang have discovered a solution to treat this condition through a long series of experiments comparing the therapeutic effects of a protein Tat Smad 7 to the existing drug on the market. The existing drug is ineffective in preventing cell death or inflammation and cannot be used to treat existing lesions. Tat Smad 7 accomplishes all of these goals and can also be applied topically prior to therapy. Further, Tat Smad 7 is a biologic rather than cell- or gene-based, which should allow it to receive easier FDA approval. We also plan to test Tat Smad 7 for its efficacy in treating other tissues and repairing wounds, including post-surgical applications to promote healing and prevent scarring. Dr. Wang plans to use the new Gates Biomanufacturing Facility to scale up production for a preclinical study in dogs at the Colorado State University Veterinary Teaching Hospital.

IMPROVING BONE MARROW TRANSPLANTATION

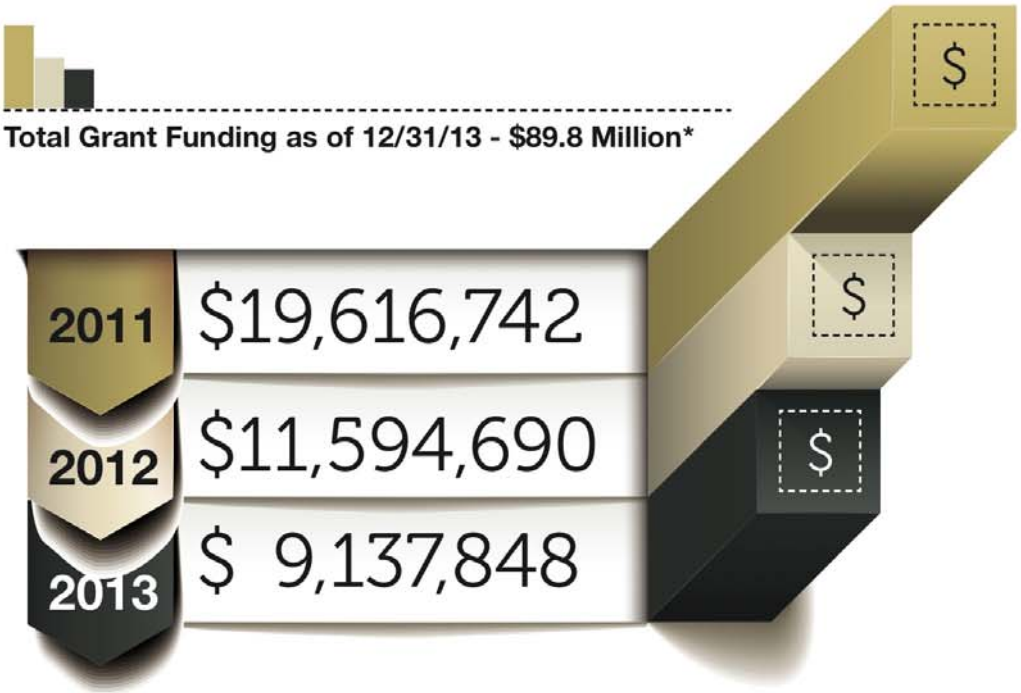
Taiga Biotechnologies, a spin-out company co-founded by Gates Center member Dr. Yosef Refaeli, is further characterizing a protein biologic that demonstrates strong evidence in mice of enhancing immune reconstitution following bone marrow transplant. Once this protein has been validated in larger animal experiments and clinical trials, the long-term goal will be to use this treatment to improve all blood stem cell transplant strategies that are used to treat a variety of medical diseases such as cancer, autoimmunity and heart attacks.

BOLSTERING THE IMMUNE SYSTEM THROUGH IMPROVED VACCINES

Taiga Biotechnologies is developing a very unique protein-based adjuvant to enhance overall immune responses to pathogens and malignancies. Taiga's initial focus for this technology is to improve existing vaccine approaches against HIV-1 and other viruses such as polio, as well as to enable vaccines to combat cancers such as melanoma and leukemia.

GRANTS

Total Grant Funding as of 12/31/13 - $89.8 Million*



In honor of the legacy of Charles Gates, who had such faith in the promise of stem cell research for the benefit of our world, the Gates Center is committed to fostering collaboration among basic scientists and clinical faculty at all disciplinary intersections of regenerative medicine and stem cell biology.

Membership in the Gates Center is open to investigators and clinicians who are currently conducting research in regenerative medicine and stem cell biology. The Gates Center serves as a virtual hub maintaining a Web site, conducting a seminar series and providing services that are designed to promote and support its members, such as fund-raising, marketing, public relations, intellectual property protection and business planning.

As of December 31, 2013, 33 Gates Center members had received a total of $89.8 million in research grant funding, 75% of which was from the National Institutes of Health. The balance of the research funding comes from the Department of Defense, Veterans Affairs Administration Merit Review, the American Diabetes Association, American Cancer Society, The Dermatology Foundation, partnering hospitals and other foundations.

**The research funding illustrated in the graph above shows significant year-to-year variations, which can be misleading because most of the awards received are three-to-five year grants. Due to cuts in overall federal spending, however, the Gates Center is genuinely concerned about prospects for the renewal of these grants at the end of three to five years and is looking at a number of research funding alternatives that will make its researchers less dependent on the NIH and other federal funding sources.*

Several new members of the Gates Center received their first grant awards during the 2013 year:

Karin Payne, PhD, and her co-investigator from Colorado School of Mines, Melissa Krebs, PhD, received a Children's Hospital Colorado & Colorado School of Mines Collaboration Pilot Award to develop a dual delivery biomaterial system that can be injected into a growth plate injury site and provide controlled release of two bioactive factors that will promote growth plate repair. This novel therapeutic approach could prevent the significant growth problems associated with growth plate injuries in children.

Kunhua Song, PhD, received a Career Development Award from the American Heart Association in support of his research efforts to reprogram adult somatic cells into cardiomyocytes (heart muscle cells).

Joe Brzezinski, PhD, received a Webb-Waring Biomedical Research Award from the Boettcher Foundation that focuses on identifying molecular events that regulate the differentiation of retinal stem cells into rod and cone photoreceptors that could be transplanted into diseased retinas as a treatment for age-related macular degeneration.

Tamara Terzian, PhD, received an award from the American Cancer Society, which focuses on the identification of novel therapeutic agents that may be used to treat early stage skin cancers that arise from UV-induced mutations in adult skin stem cells.

Enrique Torchia, PhD, received an award from the American Cancer Society to identify genetic alterations that arise in adult skin stem cells and lead to aggressive metastatic skin cancers.

CORE FACILITIES

Since January 2011, the Gates Center has been operating four core facilities that provide its members with access to senior scientists, experienced laboratory technicians and state-of-the-art equipment and technologies that individual researchers would not otherwise be able to afford. The four core facilities are: the Flow Cytometry Core, the Transgenic and Gene Targeting Core, the Morphology and Phenotyping Core, and the Induced Pluripotent Stem Cell Core. These core facilities have been established and operated with funds from the Gates Frontiers Fund, the University of Colorado Foundation, a Skin Diseases Research Core Center grant from the National Institute of Arthritis and Musculoskeletal and Skin Diseases, and Academic Enrichment Funds provided by the Dean of the School of Medicine. A brief description of these core facilities is provided on the next page:

ONE
Flow Cytometry Core

One of the most highly utilized techniques in the study of stem cell biology is flow cytometric analysis and cell sorting. Flow cytometry is the art of analyzing a single cell at a time. This technology relies on the ability to distinguish individual cells that have been "tagged" with fluorescent molecules, allowing researchers to isolate rare stem cells for further studies. The Gates Frontiers Fund supported the purchase of two state-of-the-art flow cytometers for the Center. These instruments, one an analysis machine and the other a cell sorter, provide the latest analysis and sorting technologies available. The instruments are housed in the Cancer Center Flow Cytometry Core, where Center members receive a substantial discount on their usage, as well as on the usage of the other equipment in the flow core.

TWO
Transgenic and Gene Targeting Core

Generation of genetically modified (i.e., transgenic) animals is a powerful tool for understanding the in vivo role of genes and mutations in disease or in tissue maintenance. The Transgenic and Gene Targeting core provides pronuclear injections to produce conventional and Bacterial Artificial Chromosome (BAC) transgenic mice, mouse Embryonic Stem Cell (ES) injections to produce mice with deleted genes (e.g., knockout) or mice carrying a targeted mutation (e.g., knockin mice), cryo-preservation of embryos, and embryo re-derivation. We also conduct "gene targeting" experiments in ES cells that allow the introduction of a deletion or targeted mutation into a disease promoting gene.

THREE
Morphology and Phenotyping Core

The ability of doctors and researchers to analyze diseased tissue microscopically using histological approaches is a powerful tool necessary for the understanding of disease. The Morphology and Phenotyping core provides qualitative and quantitative evaluation of tissue (e.g., skin) and appendages (e.g., hair follicles), which requires precise and reproducible orientation of tissue sections. Users submit sample biopsies following the advice from the core's histotechnicians, who contribute anatomic expertise to organizing collection protocols and to verifying the histopathological classification of specimens collected. In addition, the Core owns the equipment necessary to process and section submitted tissue samples and employs a histology technician trained in processing samples.

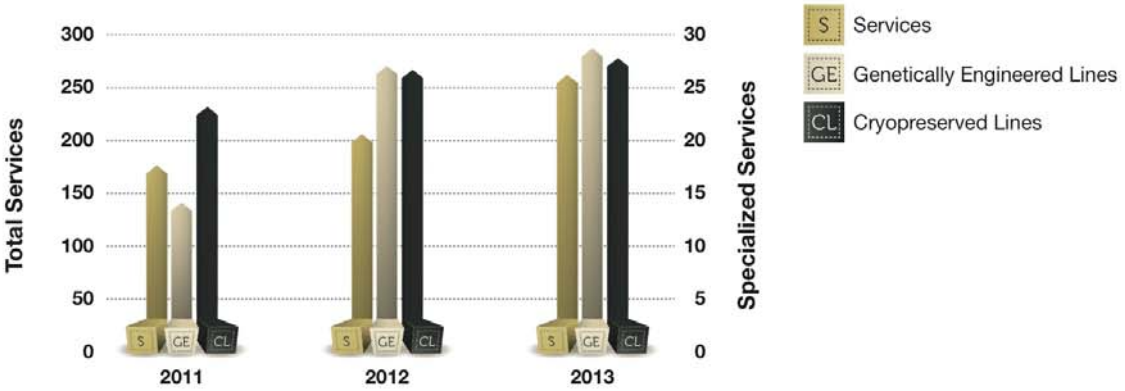
FOUR
Induced Pluripotent Stem Cell (iPSC) Core

With the advent of iPSC technology, researchers can now reprogram adult cells into cells that have the ability to become any type of cell in the adult body. This approach has tremendous potential not only for designing new therapies, but also for the understanding of complex human diseases. The iPSC core can introduce reprogramming factors into normal and diseased cells from human and mouse origin in order to generate custom-designed iPSCs lines. iPSCs from other species are currently under development. The Core is currently using both lentiviral- and sendai-viral vector systems to deliver reprogramming factors to cells. Both systems are efficient, with the latter system having the advantage of generating iPSCs with a non-DNA-integrating vector system such that no trace of the original reprogramming factors remains in the final iPSC cell line; hence they do not possess any foreign DNA that could cause disease if used in a patient.

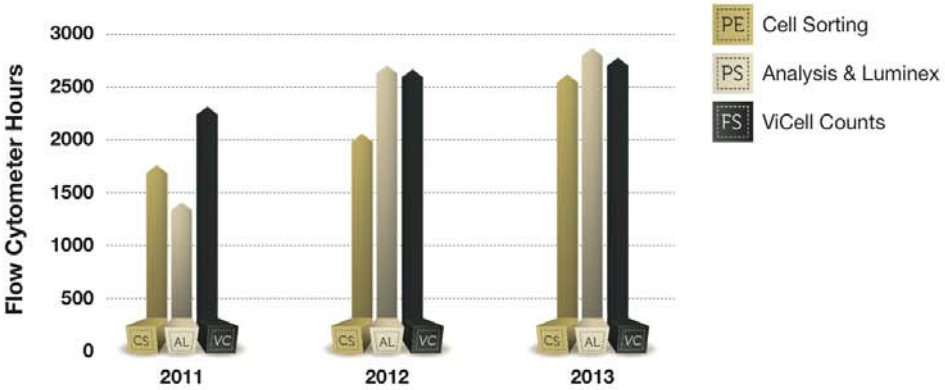
Core Usage

Figure 1. *Graphic Summaries Illustrating the Increased Use of Core Facilities by both Gates Center Members and Non-members from 2011-2013*

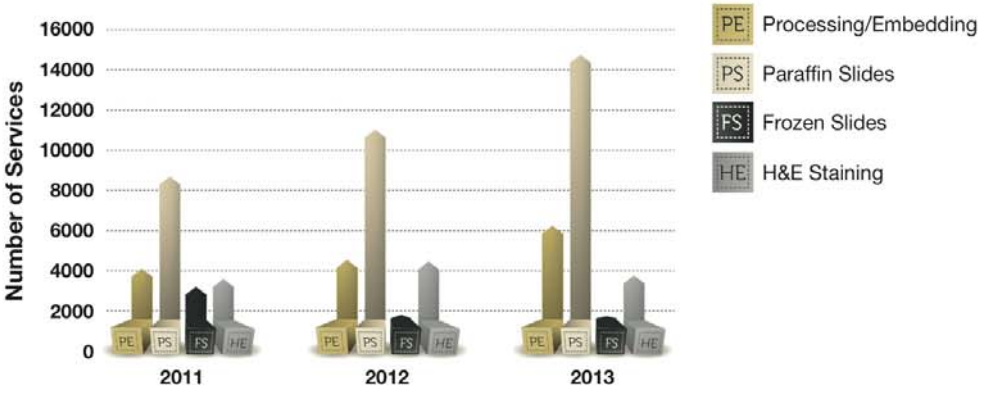
Bioengineering Core Use (Transgenic and iPSC Cores)



Flow Cytometry Core Use



Morphology and Phenotyping Core Use



In the spring of 2013, the Gates Center performed a survey of its members to determine whether they were currently using the core facilities or planned to do so in the future. We also asked about their interest in using a Good Manufacturing Practice (GMP) Biomanufacturing facility in the next five years.

Out of the 25 members who responded, 64% use the Flow Cytometry Core, and 80% intend to use it in the future; 40% use the Transgenic Mouse Core, and 48% intend to use it in the future; and 28% use the Histology Core, while 44% intend to use it in the future. The newest core, the Induced Pluripotent Stem Cell Core, has the fewest users at 16%, but 40% of the respondents intend to use it in the years to come. Finally, 25% of respondents indicated that they would use a GMP facility if it were available in the next five years.

The success of these cores in providing quality service with a quick turnaround time is further illustrated by the fact that in addition to being utilized by Gates Center members, they are utilized by investigators in 15 different Departments, Divisions or Centers within the School of Medicine; investigators in the Schools of Pharmacy and Dentistry; and investigators at National Jewish Health, UC Boulder and Colorado State University. In addition, the Transgenic and Gene Targeting Core and the Induced Pluripotent Stem Cell Core have users from outside of Colorado, including: the University of Alaska Fairbanks, the University of Alabama at Birmingham, and Thomas Jefferson University.

A graphic summary illustrating the increased use of these core facilities by both Gates Center members and non-members from 2011-2013 is shown in Figure 1. Note that the Transgenic and Gene Targeting Core and the Induced Pluripotent Stem Cell Core have recently been combined and are now called the Bioengineering Core.

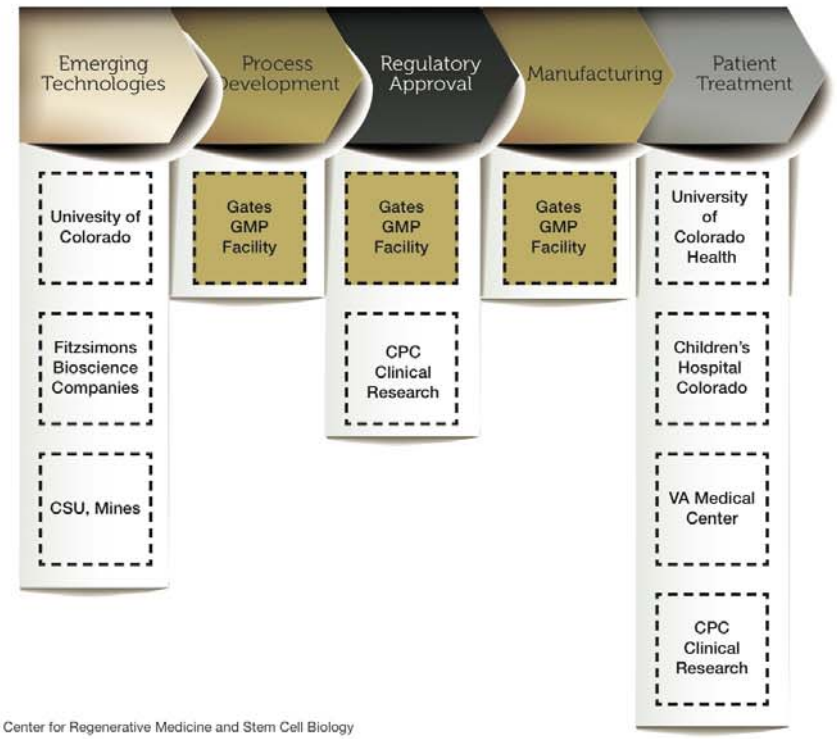
Core Costs

The Cores are operated on a cost-recovery basis, and are largely financially independent with a combined operating budget of $1,013,202 in 2013. However, the Cores receive some additional support from the Gates Center operating budget ($110,000 from Gates/CUF matching funds in 2013) and Academic Enrichment Funds provided by the Dean of the School of Medicine ($150,000 in 2013).

The Core operating budget is not currently designed to cover equipment purchases to replace, update, or expand capacity. Additional equipment purchases that were supported by the Gates/CUF matching Fund totaled $25,000 in 2013.

In addition, the five-year Skin Diseases Research Core Center grant to Drs. David Norris and Dennis Roop, awarded in September 2009, by The National Institutes of Arthritis and Musculoskeletal and Skin Diseases, provides $400,000 each year in direct costs to support four research Core Facilities, three of which (the Flow Cytometry Core, Transgenic and Gene Targeting Core, and Morphology and Phenotyping Core) are all located in the Stem Cell Center. This grant provides partial salary support for the directors of these Cores and subsidizes the costs of the Cores to keep usage fees low for Gates Center members. The grant also provides partial salary support for an administrative assistant, who also serves as the administrative assistant for the Gates Center. A renewal application of this grant was submitted in September, 2013, and we have just been informed that this grant will be funded for another five years.

GATES BIOMANUFACTURING FACILITY



In late 2013, Gates Center staff began work on a business plan for an additional core facility designed and operated to manufacture FDA approved cellular and gene products for early phase clinical trials. In the summer, 14,000 square feet of finished laboratory space in the Bioscience Park Center became available as an ideal location to establish the manufacturing facility. The Bioscience Park Center is located on the north side of Montview Boulevard and is owned and operated by the Fitzsimons Redevelopment Authority, a nonprofit organization. By the end of the calendar year, the Gates Center had secured a 15-year lease and $8.8 million in commitments from donors, foundations and campus partners to renovate, equip, retain and operate the facility through 2018.

The arrival of FDA approved manufacturing infrastructure and regulatory compliance on the medical campus will, for the first time in the Anschutz Medical Campus's history, enable researchers in this burgeoning field to develop fully their discoveries and technologies without having to look outside this area for such capabilities. This facility will also enhance the University, Children's Hospital Colorado and the University of Colorado Hospital to attract world leaders in this space.

The recently named Gates Biomanufacturing Facility is scheduled to open in early 2015. It will operate as a cost-neutral auxiliary service center of the University of Colorado School of Medicine. The facility will serve academic, clinical and commercial investigators, both Colorado-based and nationwide, looking to translate their discoveries into clinical-grade products suitable for investigational use in humans. The facility will provide the required space, equipment, regulatory compliance and process expertise for the safe development and manufacturing of cellular and gene products. To enable the processing of multiple product lines simultaneously, the facility will be comprised of multiple individual clean rooms to provide adequate segregation of different product lines.

The impact of this facility will be significant and wide ranging. First and foremost, it will enable the Anschutz Medical Campus to remain competitive among national peers and maintain our presence as a top-ranking academic medical center, capitalizing on the new wave of advanced biologic and stem cell-based therapies that require a regulatory-compliant manufacturing facility to initiate human clinical trials. It will also bind the campus together by completing a medical ecosystem that begins with basic research and flows through manufacturing, clinical trials and new standards of patient care.

Developing therapies that are predicted to utilize the Gates Biomanufacturing Facility include:

1-3 YEARS OUT

- Corneal Regeneration
- HSC Expansion for Blistering Skin Disease
- Oral Mucositis
- Esophageal Repair Following Tumor Removal
- Humanized Mouse Screening Model

3-5 YEARS OUT

- Trachea and Wind Pipe Regeneration
- Cell-Based Therapies for Cardiovascular Diseases
- Cartilage and Bone Regeneration and Cell-Based Therapies
- Cell-based Immunotherapies for Treating Cancer

COLLABORATIONS

Clinical Trials-CPC

CPC Clinical Research is a nonprofit clinical trials research organization created by the University of Colorado in 1989. CPC relates back to the University by an Affiliation Agreement, and utilizes regular members of the faculty of the School of Medicine in leadership roles within the organization. CPC's board of directors includes the Chancellor and the Vice Chancellor for Research, Dean of the School of Medicine, Dean of the Colorado School of Public Health and Chair of the Department of Medicine.

One strategic goal for CPC Clinical Research is to run clinical trials that translate stem cell discoveries into FDA approved therapies to treat a variety of disorders—a goal that is shared by the Charles C. Gates Center for Regenerative Medicine and Stem Cell Biology. The Gates Center looks forward to working with CPC in the years to come.

Clinical Trials-Internal

Cancer Stem Cell Clinical Trials Program

The Gates Center entered into a collaboration with the University of Colorado Cancer Center for the establishment of the Cancer Stem Cell Clinical Trials Program (CCTP) in 2010. This program is led by Dr. Antonio Jimeno, a member of the Gates Center.

The initial focus of the CCTP is to test novel drug candidates developed by external sources, such as pharmaceutical and biotech companies, in patients with solid tumors. To date, the CCTP has successfully reversed cancer in patients through the clinical testing of specific molecular pathway inhibitors that starve cancer stem cells.

The long-term goal of the CCTP is to use the University of Colorado clinical trials infrastructure to test novel drug candidates developed by the Gates Center and Cancer Center.

In 2013 Dr. Jimeno and his team finalized the first trial sponsored by CCTP, a Phase 1 study of a combination of drugs that are effective in eliminating cancer stem cells by inhibiting the Hedgehog pathway in cancer patients. A publication is expected in 2014. This trial was financially supported by the Gates Center and a National Institutes of Health R21 grant awarded to Dr Jimeno. In 2014 they expect to initiate a Phase 2 trial of a putative stem cell inhibitor targeting the Wnt pathway in patients with head and neck cancer. In 2014 they also expect to initiate a prospective clinical trial to establish humanized XactMice models from patients with melanoma and head and neck cancer, and help guide their therapy with the laboratory results.

INTELLECTUAL PROPERTY AND COMMERCIALIZATION

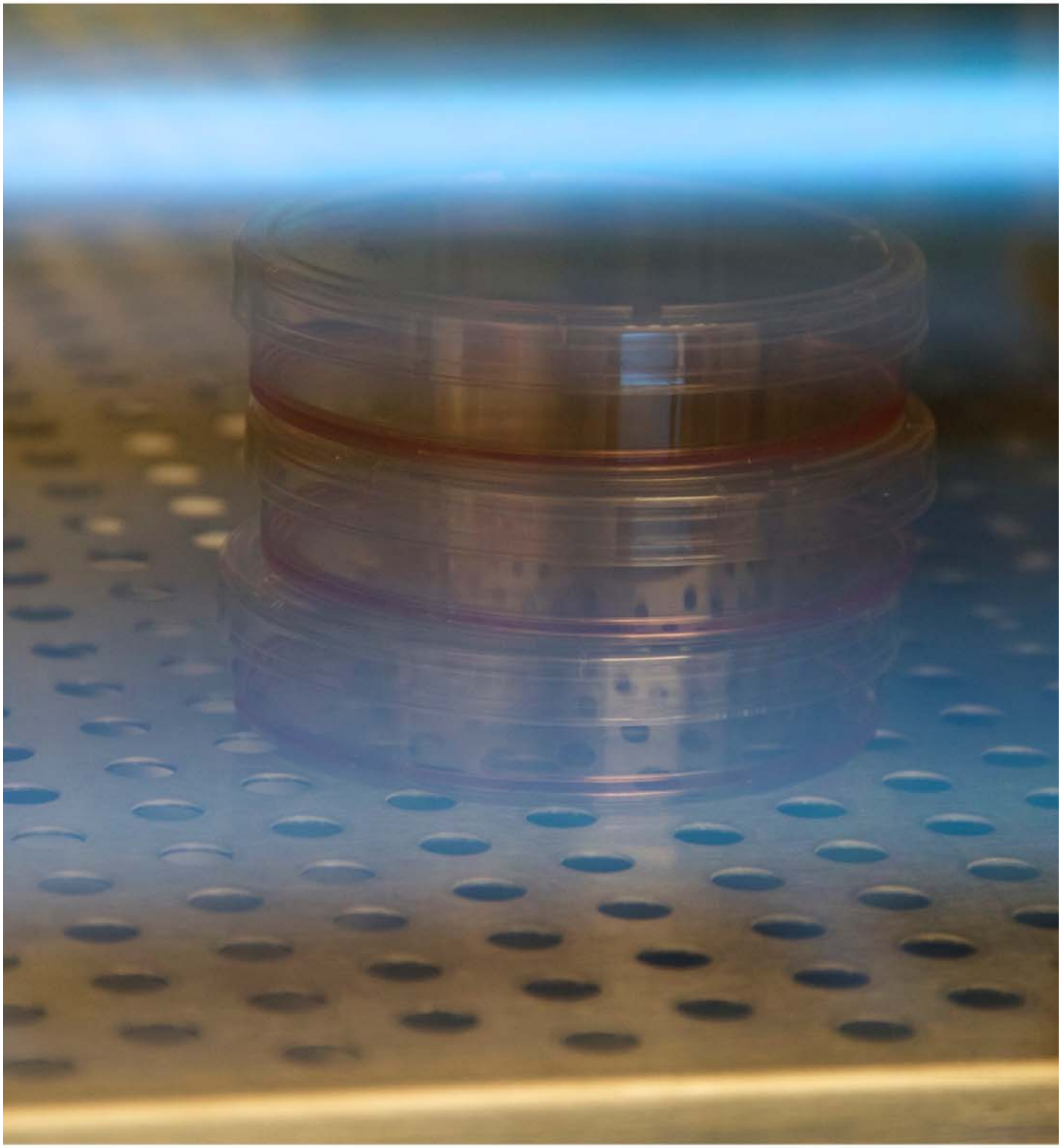
The Gates Center has a stated goal to generate technologies that result in five new startup companies over the next five years. During 2013, four different technologies emerged in the pipeline as potential startup opportunities:

XactMice: Antonio Jimeno evaluated options to create a service business using his proprietary humanized mouse model to assess cancer treatments. During the year, his provisional patent was converted to a non-provisional US patent.

Tat Smad 7: Xiao-Jing Wang identified funding support for a startup business and began the process of assessing options for commercially developing her fusion protein for oral mucositis treatment. As of the end of 2013, the original Tat Smad 7 patent is pending in five additional jurisdictions outside the US, and her new provisional patent will be converted to a US non-provisional and updated Patent Cooperation Treaty (PCT) filing.

Fusion peptide: Qinghong Zhang pursued funding options for her fusion peptide to support the formation of a startup company. The current product can be applied topically as an effective and safe treatment for inflammatory diseases, as well as administered systemically for treatment of cancer. Two provisional patents are in the process of being updated and will be filed in the PCT as one complete application.

Reprogramming adult cells into induced pluripotent stem cells: Ganna Bilousova, Igor Kogut and Dennis Roop developed a technology that allows for the reprogramming of adult human cells into clinically relevant embryonic stem cell-like induced pluripotent stem cells with unprecedented efficiency. After doing a patent search and working with the University's Technology Transfer Office, the inventors decided to retain the technology as a trade secret in hopes of opening a startup company rather than filing a patent application.



RECRUITING

The Gates Center is committed to doing everything possible to accelerate scientific discovery in stem cell research into new areas of treatment, and that includes helping attract a critical mass of scientists with complementary scientific expertise as well as skilled professionals to provide the support necessary to translate laboratory research to clinical and commercial use. During the 2013 year, the Gates Center participated in five outstanding recruitments within these categories.

Kunhua Song PhD: In summer 2013 Dr. Song joined the campus, having accepted an offer from Dr. Peter Buttrick, Chief of the Division of Cardiology, to develop a new stem cell program in cardiovascular disease. Arriving from an eleven-year stint at the University of Texas Southwestern Medical Center (UT Southwestern) in Dallas, Dr. Song is the first basic scientist within the Division of Cardiology's 25 labs to study using stem cells as a tool in the treatment of heart disease—with a dream of helping human patients suffering from heart disease return their heart function to normal. Dr. Song is an outstanding candidate who trained with Dr. Eric Olson at UT Southwestern Medical Center in Dallas, who is well known for having "trained an impressive succession of students and postdoctoral fellows, many of whom are emerging as the next generation of leaders in cardiovascular medicine." Song's recruitment was partially supported by $1 million in matching Gates Frontiers Fund/Department of Cardiology funds.

Santos Franco PhD: In fall 2013 Dr. Franco arrived on campus, having been recruited as Assistant Professor in Neural Stem Cell Biology by the Department of Pediatrics. A Senior Research Associate in the laboratory of Dr. Ulrich Muller at the Scripps Institute in La Jolla, California, Dr. Franco performed his PhD thesis research with Dr. Huttenlocher in the Department of Pediatrics at the University of Wisconsin-Madison. As an investigator, Dr. Franco's focus will be on the cerebral cortex, the control center of most of our higher brain functions, including thought, language, memory and emotion. Cortical development involves the precise specification and assemblage of billions of neurons into intricate circuits that underlie these complex tasks; however, disruption of this process is associated with many devastating human neurological disorders, including epilepsy, schizophrenia, autism and mental retardation. Dr. Franco's long-term objective is "to define the cellular and molecular mechanisms that control development of neural circuits in the cerebral cortex and to understand how defects in this process lead to brain dysfunction." Director of the Gates Center Dennis Roop, PhD, served on the search committee for Dr. Franco, who is described by his mentor, Dr. Muller, as "a truly brilliant young scientist, excellent colleague and great teacher who is highly valued by his peers."

Heather Callahan, J.D., PhD: In September 2013 Heather Callahan, who has been practicing in intellectual property for 16 years, became the first Director of Intellectual Property for the Gates Center, focusing on providing strategic advice regarding patent protection and commercialization to Center investigators. Prior to relocating to Colorado in 2012, she was the Head of Patent Development for Intellectual Ventures' Invention Development Fund, and resided in Asia. Before her legal career, Heather worked as a Research Scientist in infectious disease at the Walter Reed Army Institute of Research in the US and Brazil, having earned a PhD. from the Medical University of South Carolina, and completing her Post-Doc at Harvard Medical School.

Timothy Gardner: In December 2013 the Gates Center recruited Timothy Gardner as Director of Finance and Operations. With years of operating experience with technology, manufacturing, and financial service companies, Gardner will lead business development and entrepreneurial efforts in support of the Gates Center, the Gates Biomanufacturing Facility and Center members. Before joining the Gates Center, Mr. Gardner was the CFO and Vice President-Business Development at Boulder Ionics, a specialty chemical manufacturer providing electrolytes for advanced energy storage. In addition to his professional experience, Gardner has also been actively involved in the leadership of a number of nonprofit organizations since his move to Denver in 1985. He served as President of the Board of Trustees at St. Anne's Episcopal School for six years and is currently Chairman of the Board of the Southwestern Foundation. He was also a board member at the Kempe Children's Foundation from 1984 to 1992. He received his bachelor's degree from the University of Colorado and his M.B.A. from the Kellogg School of Management at Northwestern University.

Michael S. Perry, DVM, PhD, FRCVS: In November 2013 Dr. Mike Perry was appointed to the faculty of the School of Medicine as adjoint professor. Currently Vice President and Senior Global Program Head of Stem Cell Therapy at Novartis Pharmaceuticals Corporation, Dr. Perry will present seminars and guide graduate students and faculty at the Gates Center on current challenges in the stem cell field. Mike has held a myriad of positions over the course of his career. Prior to rejoining Novartis in 2012, he was a Venture Partner at Bay City Capital LLC from 2005 to 2012. Dr. Perry was a co-founder of Extropy Pharmaceuticals, Inc., and served as its Chairman and CEO from 2003 to 2005. He served as President and CEO of Pharsight Corp. from 2002 to 2003 and as Worldwide Head of R&D for Baxter BioScience from 2000 to 2002. From 1994 to 2000, Dr. Perry served initially as Vice President of Regulatory Affairs for Novartis Pharma (then, Sandoz) and later as President and CEO of two wholly owned cell and gene therapy subsidiary companies of Novartis. From the late 1980's to 1994, he held various executive positions at Roche Pharma (then, Syntex Corp.), Merck (then, Schering-Plough) and BioResearch Corp. Mike has served on numerous company boards during his career. Currently he is a Director of three publicly traded companies - Avita Medical Ltd., AmpliPhi Biosciences Corp. and Arrowhead Research Corp.

Dr. Perry holds a B.Sc. in Engineering/Physics, a PhD. in Biomedical Science/Pharmacology and a Doctorate in Veterinary Medicine and Surgery from the University of Guelph, Ontario, Canada. He is also a graduate of International Management Program at Harvard Business School.

EDUCATION

As an Academic Center, the Gates Center is duty-bound to share its knowledge of cutting edge research with colleagues, students of all levels, and our community. Since the establishment of a Program in Regenerative Medicine in 2006, we have participated in numerous professional meetings to share our research and mentored over 45 students from all levels of training. We have hosted more than 400 individuals for presentations and laboratory tours, including students, retirees, social and professional groups, donors, and potential graduate and medical students in the hope of spreading word about the infinite possibilities of regenerative medicine and stem cell biology.

In 2013 we mentored 12 high school and college students in our summer internship program (visit our Web site for information on the application process). Additionally, we organized 45 separate visits with presentations and lab tours, as well as traveling to present our work and potential to clubs, and participated in events for scientific and lay persons. We have offered our lab tours as auction items for charitable events, and our research staff contributes a tremendous amount of their time to promoting our Center's mission of education, raising funds for research and facilities, and moving the research forward.

All of our efforts focused on community outreach, student training and communication contribute to our mission of improving medicine with the latest scientific breakthroughs. The more the public understands and supports stem cell research along with the infinite potential it presents, the more successful scientists will be.

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PHILANTHROPY

The initial gift of $6.5 million received from the Gates Frontiers Fund in 2006 has been leveraged into $51.9 million in additional funding from both the private sector and various entities within the University of Colorado, for a total of $58.4 million as of 12/31/13.

During the 2013 calendar year, the Gates Center was the recipient of $5 million in philanthropic funding:

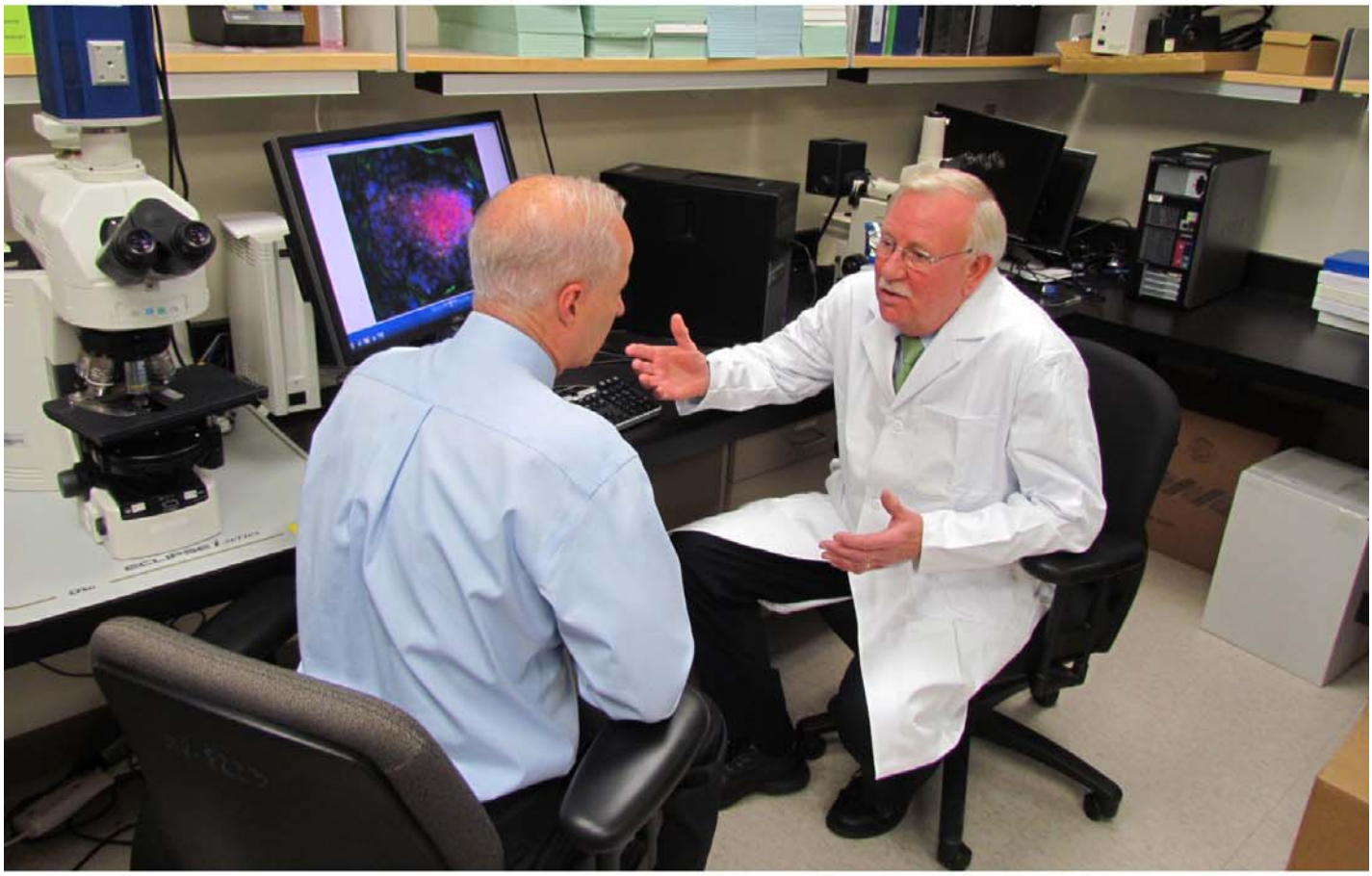
- $1.5 million: individual investigators and their research
- $2 million: Gates Center operations ($1 million each from Gates Frontiers Fund and the University of Colorado Foundation as part of five-year commitment)
- $1.5 million: initial funding toward $4.3 million total renovation and construction of the Gates Biomanufacturing Facility

In January 2013, the Center launched an effort to raise $5 million in another prioritized area of focus for the Center: support for the XactMice/head and neck cancer clinical trials program over the next three years. This funding effort aims to test a pipeline of drugs to test against cancers in vivo, expand the XactMice model to other tumor types such as pancreatic, melanoma, lung, breast, prostate and blood cancers, and continue to support the Cancer Stem Cell-directed Clinical Trials Program (CCTP). Among the champions of this effort are Peter and Rhondda Grant who, in addition to their generous support, graciously sponsored a series of luncheons to introduce this groundbreaking research and clinical trials program to a circle of individuals throughout Denver.

Other fund-raising priorities for the Center include supporting recruitment packages for new or prospective investigators working in stem cell biology. Specific opportunities will help support the study of the effects of stem cells on prostate cancer treatment and prevention, and using stem cells to explore the regeneration of bone and cartilage.

Gates Grubstake Fund

The Community Advisory Board worked closely during the 2013 year with Gates Center staff, the Chancellor's office and the Development office to explore the creation of a new philanthropic fund to provide sustainable funding for the years to come. The Gates Grubstake Fund will function as a quasi-endowment, from which annual earnings will provide seed funding for research projects that have a clear path to commercialization. Over time, our goal is to award grants in the amount of $250,000 to $500,000 for two to three research projects each year. Through pre-commercialization seed funding, we hope to contribute to the development of a bio-science investment ecosystem among universities, state and local governments and the private sector in the state of Colorado.



MARKETING

2013 was a formative one for the Gates Center in the area of marketing. Our Center staff dedicated a tremendous amount of time sharing the story of the Center with individuals and groups in the community, as well as welcoming visitors to the Center and across Montview Boulevard to the future site of the Gates Biomanufacturing Facility. Outside group presentations included Dr. Roop addressing The Mile High Club, Rotary Club 31 in downtown Denver and Evergreen Rotary, Patrick Gaines making a presentation to the Evergreen Pathfinder's Group, and Peter and Rhondda Grant cordially hosting a series of luncheons to highlight our work in the area of cancer research. Visitors who arrived to hear about and tour the Center included a number of interested individuals; Rotary 31; the Daniels Fund; Colorado Leaders, Interns and Mentors in Business (CLIMB) internship program with students from Yale, Harvard, Stanford, Middlebury, Brown and MIT; as well as 140 students from Deer Creek Middle School's 7th grade STEM class, which precipitated one of the parent chaperones to comment, "I work in a lab, and there is NO way that they would allow a group like this to visit! And everyone here was so nice and so calm…"

Essential to the Gates Center's ability to reach out to those within and beyond our scope is the Center's Web site, the current version of which was designed in 2008 with a budget of $3,000, with a goal of supporting the needs of our academic faculty. It was updated regularly throughout the year with profiles on new Center members and staff and news, as well as by the addition of a video highlighting our XactMice research breakthrough, produced in spring 2013 by Genesis Inc. and award-winning David Liban, Associate Professor of Film & Video Production at the University of Colorado Denver's College of Arts & Media. We have also spent time exploring the potential design and construction of a dynamic new Web site that will enable us to engage and appeal to a far wider audience than is currently the case, properly highlighting our brilliant investigators and promising research to users, visitors, potential recruits, media and current and prospective supporters. This project will likely be pursued in conjunction with new branding for the Center and the comprehensive development of a digital platform.

Efforts during the year were also directed toward promoting the Center among our elected officials. With the assistance of our part-time government relations counsel in Washington, we reached out to both Colorado House and Senate representatives with regard to therapies under development, plans for our Gates Biomanufacturing Facility and research dollars. Additionally, the Center hosted members of Congress, Mike Coffman and Diana DeGette and their staffs, as well as Senator Udall's district staff.

Community Advisory Board

Dennis R. Roop, PhD., Director

Diane Gates Wallach
Co-Chair

Dan Ritchie
Co-Chair

Don Elliman
Co-Chair

Dori Biester, PhD, FAAN

William Hiatt, MD

Wayne Hutchens

Greg Provenzano

Ann Sperling

Kevin Reidy

Wagner Schorr, MD

FINANCIAL SUMMARY

In 2011, Gates Center received five-year grants of $1,000,000 per year from both the Gates Frontiers Fund and the CU Foundation, intended to cover Gates Center operating expenses through the year 2015. Since then, this operating funding has supported the staff salaries and lab-related activities of the Gates Center, as well as providing over $800,000 in direct funding of research in 2012 and 2013.

The addition of the Director for the Gates Biomanufacturing Facility and the Director of Intellectual Property increased total Gates Center Staff salaries to $1,024,000 in 2013. During the same time, equipment expenditures for the Core Facilities were reduced from $414,000 in 2012 to 157,000 in 2013. In 2013 we also engaged the consulting services of marketing firm, Genesis, to assist us with a branding strategy and messaging. This $100,000 contract accounted for the bulk of the Marketing and Development expenses in 2013. In the area of research, Gates Center support totaled $470,000 last year; the majority of this to Yosef Refaeli for developing two critical projects: a cancer vaccine and the XactMice model. Finally, in 2013 the Gates Center spent considerable time and $150,000 in consulting fees investigating the possibility of establishing a venture capital fund focused on supporting inventions and discoveries within the Gates Center. The decision was made not to move forward with this effort at this time, and the Gates Frontiers Fund agreed to cover the legal expenses associated with this exploration. During the year our overall expenditures exceeded grant support by $100,000, leaving us with a fund balance of $148,000 going into the 2014 calendar year.

Infrastructure and Operations Grants	2011	2012	2013
Gates Frontiers Fund	$ 1,000,000	$ 1,000,000	$ 1,000,000
CU Foundation	$ 1,000,000	$ 1,000,000	$ 1,000,000
Fund to cover equity fund expenses			$ 150,000
Infrastructure and Operations Grants	$ 2,000,000	$ 2,000,000	$ 2,150,000

Expenditures	2011	2012	2013
Center Salary and Benefits	$ 946,037	$ 733,242	$ 1,024,952
Center Equipment	$ 134,719	$ 414,055	$ 157,500
Center Maintenance/Supplies	$ 44,643	$ 68,452	$ 53,000
Center Enrichment	$ 24,665	$ 26,165	$ 28,000
Center Educational Activities	$ 20,580	$ 20,580	$ 23,500
Marketing & Development	$ 2,257	$ 2,257	$ 102,500
Center Core Facilities	$ 277,554	$ 160,000	$ 135,000
Center Program Support	$ 42,000	$ 442,000	$ 470,833
Center Consulting Fees	$ -	$ -	$ 225,200
Center Patent Filing Fees	$ -	$ -	$ 30,000
Total Expenditures	$ 1,492,455	$ 1,866,751	$ 2,250,485

Sources - Expenditures	$ 507,545	$ 133,249	$ (100,485)
Fund Balance	$ 115,169	$ 248,418	$ 147,933

Charles C. Gates Center for Regenerative
Medicine and Stem Cell Biology

UNIVERSITY OF COLORADO **ANSCHUTZ MEDICAL CAMPUS**