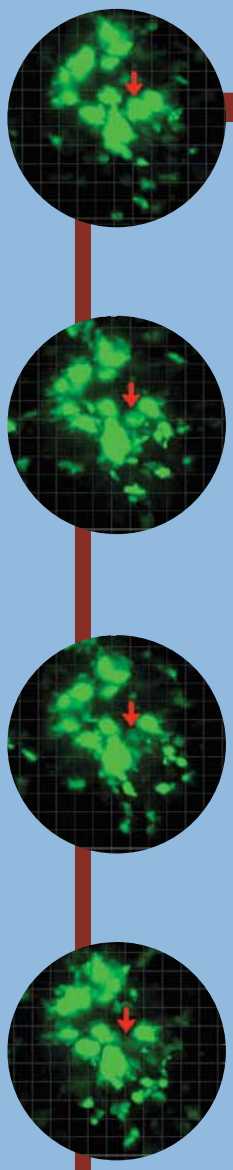
2011 Annual Report

Improving Life.

LIAI

LA JOLLA INSTITUTE *for* ALLERGY & IMMUNOLOGY

From cancer to diabetes, heart disease, infectious diseases and more—the immune system holds the key to ending the suffering brought by an amazingly vast array of disorders. In fact, millions of people around the world die each year from diseases that could be cured or prevented if the immune system were functioning properly. Recognizing its incredible power, the La Jolla Institute for Allergy & Immunology, a biomedical research nonprofit, has devoted itself to the study of the immune system, emerging as one of the top immunology organizations in the world. La Jolla Institute researchers understand both the immune system's complexities and its promise. They are experts at unraveling its intricate pathways and are at the forefront of one of the most exciting areas of medical science today—harnessing the immune system's natural mechanisms to prevent or cure disease.



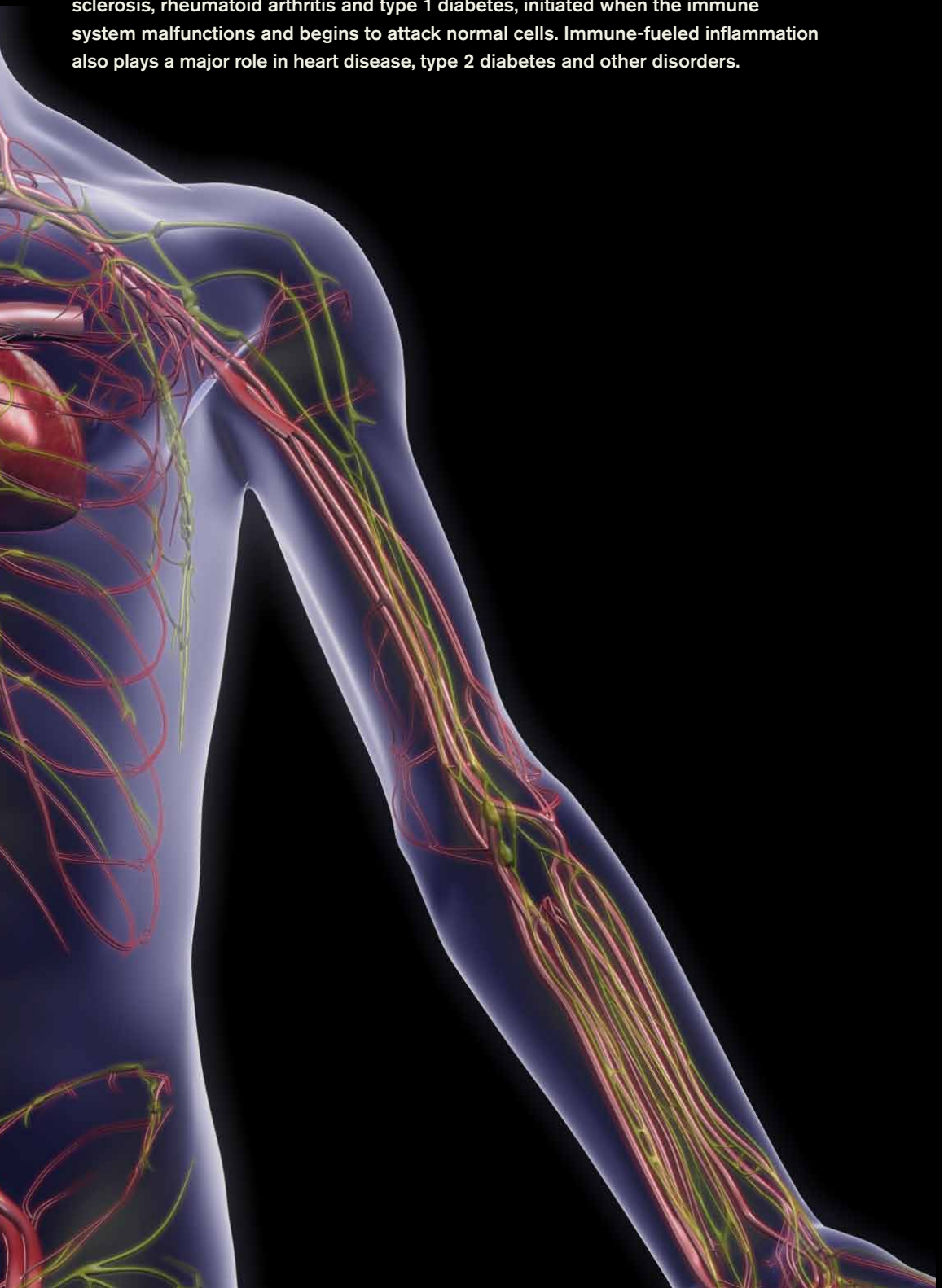
These photos showing the T cell destruction of pancreatic beta cells underlying type 1 diabetes are just one example of a malfunctioning immunesy stem. These show T cells as they attack beta cells in the pancreas of a mouse. The red arrow points to a beta cell as it is being destroyed. The photos, created by La Jolla Institute scientists, provide the world's first view of type 1 diabetes as it unfolds.

Immune system: global impact.

Millions of people around the world die each year from diseases that could be cured or prevented if the immune system were functioning properly. La Jolla Institute is a world leader in research focused on harnessing the immune system's mechanisms to fight disease.

Immune system: defender and attacker.

The immune system, with its estimated 1.5 trillion cells, can be thought of as the body's defending army, shielding us daily from an onslaught of bacteria, viruses and other dangerous microbes. While this is the helpful side of the immune system, which scientists seek to enhance through vaccines and cancer therapies, there is also a harmful side of the immune system, which researchers seek to find ways to suppress. Harmful immune responses can cause autoimmune diseases like multiple sclerosis, rheumatoid arthritis and type 1 diabetes, initiated when the immune system malfunctions and begins to attack normal cells. Immune-fueled inflammation also plays a major role in heart disease, type 2 diabetes and other disorders.



Enhancing health.

It is impossible to live a life untouched by illness. But it is a startling fact that for the majority of diseases, including cancer, diabetes, multiple sclerosis, tuberculosis and asthma–the immune system offers the greatest potential for natural prevention, treatment and eradication. With that realization, our founders launched La Jolla Institute over 23 years ago to focus on the extraordinary potential of harnessing the immune system to fight against disease. Over relatively few years, we have earned a reputation for scientific excellence, and we are now recognized as one of the top five organizations in the world for immunology research, including all universities, research institutes and hospitals. Despite its importance for human health, our dedicated focus on immunology is almost unique in the United States. This focus allows us to attract the top researchers in the field, and our long list of research advances includes five discoveries that are now in pharmaceutical development. Even though we have made many discoveries, we now stand on the threshold of a new era of therapeutic potential. Tremendous medical advances over the last 15 years have shown that the body's defense system offers great promise for new medical interventions against cancer, heart disease and many other diseases whose control has long eluded the medical community. Immunology's application in medicine is still unfolding, and our research institute is proud to be at the forefront.

In this annual report, you will read about some of our discoveries that demonstrate how understanding immune system function has amazing potential for affecting human health. Regarding heart disease, researchers are finding ways to stop immune-fueled inflammation that significantly worsens plaque buildup. In our new RNA interference (RNAi) genomics center, our scientists have identified genes related to many diseases and, further, are seeking ways to turn off those detrimental genes. In infectious diseases, a researcher has discovered the trigger for protecting the body's borders against diseases like AIDS and listeria.

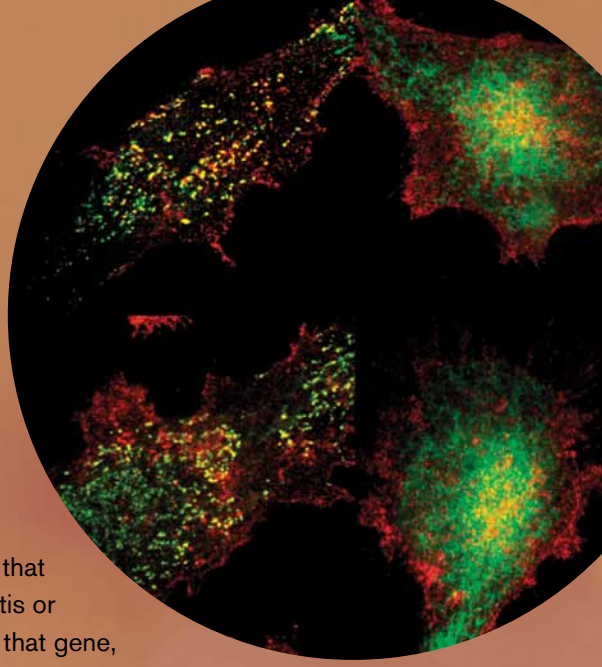
Our ability to conduct this critical research relies heavily on funding from the National Institutes of Health (NIH). We are proud to say that we rank among the most elite institutions in the country in our scientist's ability to secure this funding. However, the NIH budget was reduced in fiscal year 2011 and when adjusting for inflation, research funding has declined very significantly over the last decade. Therefore, philanthropic support is even more important now for enabling our critical research to proceed. This is especially true for the retention and recruitment of top scientists, for the funding of high impact but more risky projects, and for obtaining the latest research equipment–all areas that are difficult, if not impossible, to fund from the NIH.

We invite you to read on to learn more about how we are marshalling the immune system toward new therapies to improve the lives of millions.

Sincerely,

Mitchell Kronenberg, Ph.D.
President & Chief Scientific Officer

Accelerating the search for gene therapies.



Flipping a Genetic Switch to Cure Disease

Institute Opens New Center to Identify Disease-Causing Genes

Picture being able to pinpoint the exact gene that causes multiple sclerosis or rheumatoid arthritis or cancer. Now imagine being able to switch off that gene, thereby stopping the disease dead in its tracks. While it may sound like a scene from a futuristic movie, it is actually a very real possibility at La Jolla Institute, where researchers are using RNA interference (RNAi). A groundbreaking gene-silencing technology, RNAi earned its discoverers the Nobel Prize in medicine in 2006. La Jolla Institute opened a dedicated RNAi Center in 2011, one of the few such centers in the world. Backed by $12.6 million in funding from the National Institutes of Health, the Center features the latest in high-speed RNAi technologies, which enable scientists to rapidly sift through thousands of genes. "RNAi lets us explore the function of each gene, so that we can determine how it fits into the disease process," said Institute President & Chief Scientific Officer Mitchell Kronenberg, Ph.D., the RNAi Center's co-principal investigator with Anjana Rao, Ph.D. Dr. Rao is a prominent genetics and cell biology researcher and a member of the prestigious National Academy of Sciences recruited from Harvard Medical School in 2010. Dr. Rao said the Center's initial goal was to identify all the genes involved in the various immune diseases studied at the Institute. "In one of our screens, we identified 887 genes or 4 percent of the human genome as being involved in immune function," said Dr. Rao, adding that the genome contains 22,000 genes. The next step will be to determine how each gene malfunctions in each disease. "This will allow us to develop combined therapies that, by targeting many genes at the same time, would ameliorate the disease symptoms and, ideally, cure the disease," said Dr. Rao. "Eventually we hope to extend these approaches to other disease areas including cancer and diseases of the nervous system such as Parkinson's and Alzheimer's disease."

Anjana Rao, Ph.D.

Attacking heart disease and cancer.

"Immune-system fueled inflammation is a major, but inadvertent, contributor to arterial plaque buildup, also known as atherosclerosis, which is the underlying cause of most heart problems."

– Lynn Hedrick, Ph.D.

Immune System Proves to be Unintended Culprit in Heart Disease

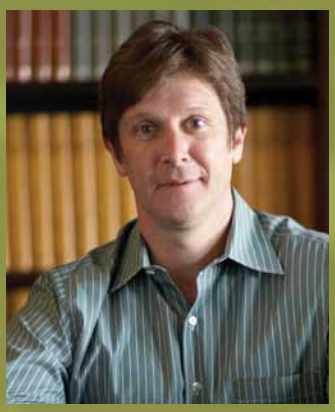
Institute Pioneers Methods for Blocking Inflammatory Damage

Most people probably know that heart disease remains the nation's No. 1 killer. But what many may be surprised to learn is that cholesterol has a major accomplice in causing dangerous plaque buildup in our arteries. It turns out that our usually friendly immune system figures prominently in predisposing the body to a heart attack. While this may seem counter intuitive (after all, isn't the immune system our defender?), it is actually a case of good intentions gone bad. "Immune-system fueled inflammation is a major, but inadvertent, contributor to arterial plaque buildup, also known as atherosclerosis, which is the underlying cause of most heart problems," said scientist Lynn Hedrick, Ph.D. Fortunately, the La Jolla Institute is using its renowned immune system expertise to pioneer new ways to stop inflammation-producing cells from worsening cardiovascular disease. The main cells of interest are macrophages, molecular scavengers that flock to the artery wall to gobble up fat (plaque) caused by cholesterol and other factors, said Dr. Hedrick. Unfortunately, this normally positive function turns bad, when many fat-laden macrophages get bogged down in the arteries. "These cells become inflamed which further increases the plaque buildup," said Dr. Hedrick. In 2011, her discovery of a molecular switch that triggers the production of specific macrophages that lessen, rather than boost, inflammatory plaque buildup, offers hope for new ways to reduce heart disease.

Lynn Hedrick, Ph.D.

Scientist Rewrites Classic Understanding of Activating "Killer" T Cells

Discovery Could Lead to New Cancer-fighting Immunotherapies



Stephen P. Schoenberger, Ph.D.

At its core, cancer is the result of bad cells run amok. These abnormal, wayward cells, which under normal conditions would happily complete their jobs and die off, instead replicate with a ferocious zeal, causing damage to surrounding tissue and organs through tumor formation. Stephen P. Schoenberger, Ph.D., is one of a growing number of researchers who believe that recruiting the immune system to kill off these reckless cells offers a powerful approach to controlling cancer. A recent finding by Dr. Schoenberger accelerated those efforts by clarifying the molecular process that triggers CD8+ "killer" T cells to attack and destroy damaged cells, such as those in cancer. The discovery also has application for activating these cells against infections, and represents a major scientific finding. "Understanding the biology of killer T cells is critical to advancing new approaches to autoimmunity, infectious diseases and the immune response to cancer," he said, adding that mobilizing these immune cells against cancerous cells has long been a goal of tumor immunologists. Specifically, Dr. Schoenberger discovered that the molecular steps leading to CD8+ killer T cell activation behave differently, in certain respects, than the current scientific model. "We found that a growth factor (called IL-2) thought to be provided by "helper" T cells is instead made by the killer T cells themselves when properly stimulated." Such details are essential to develop potential therapeutics, he added. "Identifying the exact pathway through which CD8+ T cells are actually generated gives us new possibilities for manipulating these cells in cancer and other diseases."

Cancer is the second leading cause of death in the U.S. today. While its cure has remained elusive, new approaches, based on boosting the immune system to fight cancer, is an area generating significant excitement. La Jolla Institute researchers are immunology leaders, exploring new mechanisms that would increase the immune system's ability to destroy cancerous cells.

Infectious diseases kill more people worldwide than any other single cause. This makes the search for new vaccines critically important. La Jolla Institute discoveries are moving the world closer to first-ever vaccines for malaria, AIDS, dengue virus and other dangerous pathogens, which annually cause millions of deaths around the globe.

Researcher Finds New Way to Shore Up Body's Borders

Discovery Could Be "Missing Link" in Search for AIDS and Listeria Vaccines

In military strategy, protecting one's borders is absolutely essential for ensuring a solid defense. Interestingly, the same can also be said for our body's borders, especially when it involves dangerous pathogens like listeria, which last year produced the worst foodborne illness outbreak in U.S. history. In the midst of reports on the rising death toll, La Jolla Institute researcher Hilde Cheroutre, Ph.D., published her discovery of what may be the missing link for generating first-ever vaccines against listeria, HIV (the virus that causes AIDS), and other infections that most often invade our bodies through mucosal borders. Dr. Cheroutre said her study's timing, published in the prestigious journal *Nature Immunology*, was coincidental with the listeria outbreak. However, it nonetheless pointed out the critical importance of developing a vaccine against this bacteria, which caused 30 deaths and 146 cases among people eating contaminated cantaloupe. In her study, Dr. Cheroutre uncovered a previously unknown mechanism that triggers the body's strongest T cells to shore up our largest borders—the intestines and other mucosal linings. It is at these points (through mucosal linings such as those of the mouth, nose, intestines and lungs) that many pathogens such as HIV, influenza and listeria often enter the body. "If we can develop vaccines, which use this mechanism to trigger selective pre-existing T cell buildup at these critical borders, we can stop these pathogens at their primary entry port. This would be extremely important in preventing significant death and disease," she said. In addition to finding the T cell trigger, Dr. Cheroutre also identified a specific cell type that confirms the protective border buildup occurs.

Hilde Cheroutre, Ph.D.

Combating infectious disease.

Institute's Tenacity Creates Worldwide Disease-Fighting Tool

NIH Awards Institute $22 Million to Continue Database Leadership Role

For eight long years, a group of doctors spent their days reading and culling information from thousands of research papers. An admittedly tedious task, these scientists were like sleuths on a mission that had at its core vitally important data, with the power to influence sickness, disease and even life and death. The M.D.s and Ph.D.s were employees of La Jolla Institute, which in 2003, took on the enormous task of designing and developing a worldwide research tool, known as the Immune Epitope Database (IEDB). Created under a multi-million dollar competitive contract from the National Institutes of Health (NIH), the database contains information on thousands of epitopes. Epitopes are tiny pieces of a larger target that allow cells of the immune system to focus an attack. Such information is critical to researchers attempting to design new and better vaccines against infectious diseases such as tuberculosis or new treatments for allergies, asthma and autoimmune disorders, such as type 1 diabetes or multiple sclerosis. The database is freely available to researchers worldwide and is designed to quicken the pace of discovery around the globe. Bjoern Peters, Ph.D., IEDB co-lead investigator, said the Institute's team recently completed the massive epitope data collection and input phase. Nearly 100,000 epitopes and over half a million experimental data points are now classified. "Our mission going forward is creating new ways and tools for aggregating the data in the most useful and meaningful ways possible," he said. The NIH recently awarded the Institute a seven-year, $22 million contract renewal that will maintain its database leadership role through 2019. "We see this contract renewal as a vote of confidence from the NIH," said Alessandro Sette, Ph.D., co-lead investigator.

Bjoern Peters, Ph.D.

Alessandro Sette, Ph.D.

Institute Provides World's 1st Look at Diabetes as it Unfolds

Movies of the Working Pancreas to Boost Search for New Treatments

Matthias von Herrath, M.D.
Ken Coppieters, Ph.D.

The age-old idiom says that "seeing is believing." On the heels of a very visual scientific and technologically stunning achievement, Institute researchers might argue instead that "seeing is understanding." Using a high-powered specialized microscope and an ingenious imaging technique, Institute researchers have created the world's first movies showing the cellular progression of type 1 diabetes in real-time in mouse models. This dynamic view is providing the worldwide scientific community with insights into this disease process as never before possible, and may profoundly affect future directions in type 1 diabetes research. Matthias von Herrath, M.D., a world-renowned type 1 diabetes researcher and director of the Institute's Diabetes Research Center, led the project, which illuminates cell processes that previously had to be extrapolated from photos, computer modeling or lab experiments. Ken Coppieters, Ph.D., who co-produced the movies, said the videos provide surprising information about the search and destroy mission of T cells, which kill insulin-producing beta cells in the pancreas, leading to type 1 diabetes. "These videos point the way toward developing new prevention strategies to stop the beta cell destruction before the onset of type 1 diabetes," said Dr. von Herrath. The videos drew international headlines and admiration from diabetes experts. George Eisenbarth, M.D., Ph.D., executive director of the Barbara Davis Center for Childhood Diabetes, called the movies "quite remarkable," while Bart Roep, M.D., Ph.D., professor at Leiden University Medical Center in the Netherlands, said he found the study amazing. "I thought it couldn't be done. But thankfully, they proved me wrong."

Type 1 (juvenile) diabetes is usually diagnosed in childhood. Suddenly the typical joys of youth are replaced by the rigorous day-to-day demands of a chronic and challenging disease. La Jolla Institute is a world leader in research toward new ways to prevent, treat or cure this serious disorder.

Unraveling autoimmune diseases.

Discovery Opens Potential New Treatment Avenues for Autoimmune Diseases

Finding Could Facilitate New Therapies for Multiple Sclerosis, Rheumatoid Arthritis and More

Amnon Altman, Ph.D.

Buried deep in the body's jam-packed cellular highways is a tiny enzyme with a huge impact on multiple sclerosis, rheumatoid arthritis and a host of other autoimmune diseases. Fortunately, for disease sufferers, this enzyme has been the subject of intense and long-term scrutiny by Amnon Altman, Ph.D. Dr. Altman's fascination with the enzyme, protein kinase C theta (PKC-theta), began in 1993 when he discovered its existence and found that it had a major hand in directing the immune system's T cells to mount an effective immune response. Considered a major scientific advance, Dr. Altman continued to explore the precise details of how this enzyme participates in activating T cells, soldier-like white blood cells that defend the body against disease. In 2011, he hit pay dirt, revealing that PKC-theta interacts with a stimulatory receptor on the surface of T cells, known as CD28, to enable the T cell attack. Regarded as a breakthrough in scientific understanding, Dr. Altman went one step further and proved that if he blocked this interaction it would stop the immune onslaught, a highly desirable outcome in autoimmune diseases. "In autoimmune diseases, the immune system's T cells mistakenly attack and destroy healthy cells," said Mitchell Kronenberg, Ph.D., the Institute's president & chief scientific officer. "Consequently, Dr. Altman's finding opens the door to the potential development of new autoimmune therapies based on circumventing this cellular interaction." Dr. Altman is working on just that, seeking ways to therapeutically block this cellular meeting. "It will require creative strategies," he said. "But the potential is exciting."

FISCAL YEAR ENDED DECEMBER 31, 2011

Supporting research.

2011 Marks Year of Innovation, Continued Financial Strength

Fiscal year 2011 was a year of innovation and expansion in two key program areas at La Jolla Institute. One of these areas involved our decision to join the Sanford Consortium for Regenerative Medicine, a stem cell research "collaboratory" on the Torrey Pines Mesa. Our second area of expansion was the creation of a new RNA interference (RNAi) Center, one of a few such centers in the world. The Center lays the groundwork for the therapeutic use of RNAi to silence disease-causing genes.

The RNAi Center's launch was financed by a $12.6 million grant from the National Institutes of Health (NIH), which the Institute secured in a highly competitive review process. Its receipt reflects our scientists' history of excellence in obtaining NIH research funding, which has been a major contributor to our scientific and financial success.

La Jolla Institute continues to operate in a strong and stable financial position, with no scheduled debt, and total assets in excess of $27 million as of December 31, 2011. Total revenues have increased steadily during the past five years to an all-time high of $48.27 million in 2011, while 88% of Institute expenses are used for research. This reflects our intense concentration on scientific discovery, with administrative costs kept to a minimum.

While the Institute has enjoyed growth and success, challenges are on the horizon. An era of constrained federal budgets will make obtaining NIH grants an even more competitive endeavor in the years ahead. With nearly 80 percent of our budget funded through NIH grants, we remain cognizant of these economic pressures. As a result, we are increasing our operating reserves, while maintaining our strategic goal of diversifying revenues through technology licensing and philanthropy.

In summary, La Jolla Institute's financial position and outlook remain positive. We would like to recognize and thank our longtime industry partner, Kyowa Hakko Kirin California, Inc., in providing a stable source of unrestricted research funding while facilitating the translation of our discoveries into potential treatments for human disease. We are also profoundly grateful to our expanding group of donors and loyal supporters, as well as our talented and dedicated scientists and support staff.

Charles A. Carpowich, Jr.
Executive Vice President & COO/CFO

2011 Financial Data

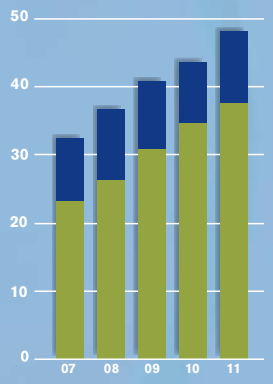
STATEMENT OF FINANCIAL POSITION

Cash and investments	$	10,792,000
Grants receivable and other		7,071,000
Property, net		9,400,000
Total assets	**$**	**27,263,000**
Accounts payable and accrued expenses	$	8,329,000
Deferred revenue		737,000
Total liabilities	**$**	**9,066,000**
Total net assets	**$**	**18,197,000**
Total liabilities and net assets	**$**	**27,263,000**

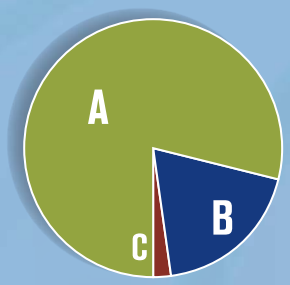
STATEMENT OF ACTIVITIES

Revenues:		
NIH grants and contracts	$	37,509,000
Private grants and contracts		9,086,000
License revenue		1,102,000
Contributions		350,000
Investment return and other		223,000
Total revenue	**$**	**48,270,000**
Expenses:		
Research	$	40,660,000
General and administrative		5,247,000
Fundraising		242,000
Total expenses	**$**	**46,149,000**
Change in net assets	**$**	**2,121,000**

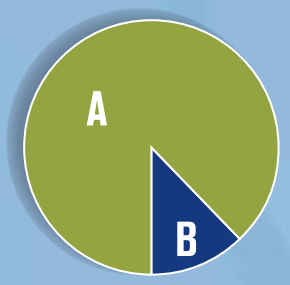
2011 Financial Data summarized from LIAI's December 31, 2011 audited financial statements.



REVENUE GROWTH
in millions
NIH GRANTS AND CONTRACTS
OTHER REVENUES



REVENUES
A) NIH grants and contracts 78%
B) Private grants and contracts 19%
C) License and other revenue 3%



EXPENSES
A) Research 88%
B) G&A and Fundraising 12%

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La Jolla Institute's President's Council, formed in 2011, helps to accelerate our pace of discovery by providing critical philanthropic support. We are extremely grateful to our founding members (listed below), who gave $1,000 or more in unrestricted funding toward our research.

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A Salute to Dr. and Mrs. Frank J. Dixon

Major Gift is Part of Their Continuing Legacy of Leadership, Friendship and Support

Since its inception in 1988, La Jolla Institute has been honored by the dedication, leadership and enduring contributions of Dr. Frank J. Dixon and his wife Marion. Frank was one of the founding fathers of San Diego's life science community, having moved from the University of Pittsburgh in 1961 to found the Scripps Research Institute, which he directed until 1987. After retiring from Scripps, he was instrumental in founding La Jolla Institute, and served on its Board of Directors for 16 years, 14 of those as Chairman. Frank was a renowned scientist and mentor who received numerous awards, including election to the National Academy of Sciences. "Frank's career was one of pioneering endeavors and remarkable scientific achievement," said Mitchell Kronenberg, Ph.D., Institute president and chief scientific officer. "Our organization benefited greatly from his guiding hand, forthright style and keen insight." Following Frank's death in 2008, the Institute established an annual Frank Dixon Day on his birthday, March 9th, to recognize his many contributions. "The event also allows us to honor Frank's wife Marion, who has carried on the family's legacy of friendship," said Dr. Kronenberg. In 2011, Marion honored the Institute with the largest individual gift in its history. The Institute's faculty and staff remain very proud of their association with the Dixon family, and wish to express sincere gratitude for their 25 years of leadership and support.

Marion Dixon and Skip Carpowich, La Jolla Institute Executive VP & COO/CFO

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La Jolla Institute for Allergy & Immunology

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La Jolla Institute Joins Stem Cell Research Consortium

La Jolla Institute became the fifth organization in the prestigious Sanford Consortium for Regenerative Medicine in 2011, joining colleagues from the Salk Institute, The Scripps Research Institute, UC San Diego and the Sanford-Burnham Medical Research Institute in the first-of-its-kind multi-institutional stem cell research collaboration. Opened in November, the Consortium marshals the intellectual resources of the five organizations—all world-leaders in life sciences—toward improving human health through stem cell research. La Jolla Institute scientist Anjana Rao, Ph.D., a prominent genetics and cell biology researcher, moved part of her lab into the new building in early 2012. Institute president & chief scientific officer Mitchell Kronenberg, Ph.D., is now a member of the Consortium's Board of Directors.

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Understanding the Immune System

(And Why It Offers New Approaches for Conquering Diseases That Have Long Plagued Society)

Consider the story of the Boy in the Plastic Bubble. David Vetter, born in 1971, suffered from a rare genetic disorder that rendered his immune system useless and left him vulnerable to a daily barrage of disease-causing micro-organisms. As a result, he lived almost his entire life in a specially-constructed bubble-shaped sterile environment. For him, venturing out was certain death. Sadly, David died in 1984 following an unsuccessful bone marrow transplant that doctors had hoped would restore his immune response. David's story illustrates one of the immune system's most vital functions—protecting us from infection. Without it, we would die.

But there's a lot more to the story of the immune system's role in health and disease. In fact, its disease-fighting capabilities extend way beyond what anyone could have imagined just 20 years ago.

A New Era in Immunology

Over the past 20 years, medical research has shown that the immune system is critically involved in diseases that affect nearly every organ of the body. Consequently, we now realize that harnessing its power holds great promise for new therapies that have remained elusive until now. New approaches that engage or control the immune system will treat a spectrum of diseases including cancer, heart disease, diabetes, AIDS, Crohn's, rheumatoid arthritis, as well as many more diseases. Simply put, harnessing the power of the immune system represents *one of the greatest single disease-fighting strategies that biomedical science has to offer.* Reflecting this fact, the immune system's failure to function properly contributes to the deaths of two-thirds of all Americans who die from disease each year. Many diseases related to immune malfunction, including cancer and diabetes, could be prevented if the immune system's well-intended, but misguided activities against the body's healthy tissues, were brought in line.

Read on to learn more about your immune system, and how La Jolla Institute researchers are world leaders in understanding its mechanisms so that new ways can be found to treat or prevent a vast array of diseases.

Q&A

What is the immune system?

Each day, our bodies are under attack. While invisible to the naked eye, millions of bacteria, viruses and other microorganisms, constantly circulate around us. Our immune system protects us via a network of more than a trillion cells, working together in tissues and organs to create our very own department of defense. Basically, it is our immune system's job to keep foreign invaders out or, failing that, to destroy them once they enter our bodies. This process works most of the time, although not always, which is why we occasionally don't recover quickly from colds, flu and other infections.

What about vaccines? How do they figure into immune protection?

An encounter with a virus "teaches" our immune system to recognize and remember that viral bad guy in the future. This "immune memory" is a hallmark of the immune system that enables it to wipe out that same virus with breakneck speed if seen again. A vaccine's purpose is to create immune memory, without you having to ever be infected. To accomplish this, vaccines usually contain noninfectious pieces of viruses or bacteria that cement themselves in our immune system's memory, without making us sick. Upon reencountering the actual live virus, our immune system uses antibodies and "killer" cells, which act like a team of cellular ninjas seeking out and destroying the previously encountered

(over)

invaders. At La Jolla Institute, we have some of the top vaccine biology experts in the world, and are leaders in the use of computer technology to accelerate new vaccine development.

And if you don't think vaccines are critically important, consider this:

Vaccines have led to some of the greatest public health triumphs ever, including the eradication of naturally occurring smallpox from the globe and the near eradication of polio. Another example—in 1900, diphtheria killed more people in the United States than cancer. Thanks to vaccination, diphtheria cases are now extremely rare among U.S. residents.

What are autoimmune diseases? What causes them?

The key to a healthy immune system is its remarkable ability to distinguish between our body's own cells, recognized as "self," and foreign cells, or "nonself." When immune defense cells encounter these "nonself" foreign invaders (i.e., viruses, bacteria), they quickly launch an attack. Unfortunately—in an apparent case of mistaken identity—our immune system sometimes gets it wrong and attacks our own healthy cells or tissues. This results in damage leading to autoimmune diseases.

Why are there so many different types of autoimmune diseases?

The type of autoimmune disease depends on the part of your body that is attacked. For instance in type 1 diabetes, the immune system destroys insulin-producing beta cells in the pancreas, and in multiple sclerosis, it attacks the insulation surrounding nerve cells. Rheumatoid arthritis results from an immune attack within your joints. Overall, there are at least 80 known autoimmune diseases. Collectively these diseases affect up to 8 percent of the U.S. population.

What is inflammation? Is it caused by the immune system?

Inflammation is the gathering of immune system cells and molecules at an infected or injured site. This is a good thing designed to promote healing. You can see this activity at work when you get a cut on your finger. The initial swelling and redness (inflammation) shows that your immune system is busily working to heal the cut. However, trouble arises when this inflammatory response is prolonged or shows up where it's not needed. In prolonged instances, inflammation harms body tissues. Heart disease, type 2 diabetes, autoimmune diseases, stroke and many other diseases are linked to chronic inflammation. Allergies and asthma are the acute symptoms you feel resulting from an inappropriate inflammatory response. La Jolla Institute researchers have made major advances in understanding the molecular basis of inflammation and are seeking ways to turn off its unwanted occurrence.

And finally the Big "C," how does the immune system affect cancer?

Although there are many kinds of cancer, they all begin because of the uncontrolled growth of abnormal cells. Ordinarily, our immune system would recognize these cells as damaged or mutated and eradicate them. Unfortunately, cancerous cells devise ways to escape our immune system's usual mechanisms for stamping out abnormal cells. La Jolla Institute researchers are seeking ways to suppress the growth of these escapees, and to boost our immune system's ability to destroy cancerous cells when they arise.