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DR. JEAN-PIERRE ISSA

Coriell's President & CEO

I am immensely proud to present to you our Annual Report for 2023, celebrating the remarkable growth and achievements of the past few months. This year has been a testament to our commitment to research, and what we built this year will serve as Coriell's foundation for many years to come.

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The achievements over the last year predict one thing for Coriell's future—growth. And that growth will stem from our transformative efforts in cancer research and as a worldleading biobank.

Much of this growth will be enabled by the new Camden Cancer Research Center, a groundbreaking achievement for our region. This one-of-a-kind effort is made possible by our work to build a research team capable of such an effort. Our mission to drive discoveries and accelerate the development of life-saving therapies is focused and supported by this center, fostering a culture of creativity and collaboration among our fellow scientists.

To accommodate this great expansion, we will need new space. That will come soon as Coriell will be breaking ground on its new headquarters just down the road from our current location in the coming months. This new building is the most exciting endeavor in the Institute's history. Coriell will soon have a new state-of-the-art headquarters tailor-made for our unique needs. This modern facility will serve as a hub for groundbreaking research, cutting-edge technology, and a nurturing environment to attract the brightest minds in the industry—a major priority of mine as we grow the CCRC.

Our biobank, long Coriell's most storied pillar, celebrated significant achievements this year as well, as you'll read in this report. Among them is the 50th anniversary of the National Institute of General Medical Sciences' Human Genetic Cell Repository and a major paper in *Nature* from the Human Pangenome Reference Consortium, in which Coriell plays an important role.

None of these accomplishments would have been possible without our remarkable team's dedication, passion, and resilience. To each member of the Coriell family, I extend my heartfelt gratitude for your unwavering commitment to our mission. You are the driving force behind our success, and your efforts continue to inspire us all.

I also extend my most profound appreciation to our external partners, collaborators, donors, and supporters, without whom our endeavors would not be possible. Your belief in our mission allows us to push farther and plot an ambitious future for this historic organization.

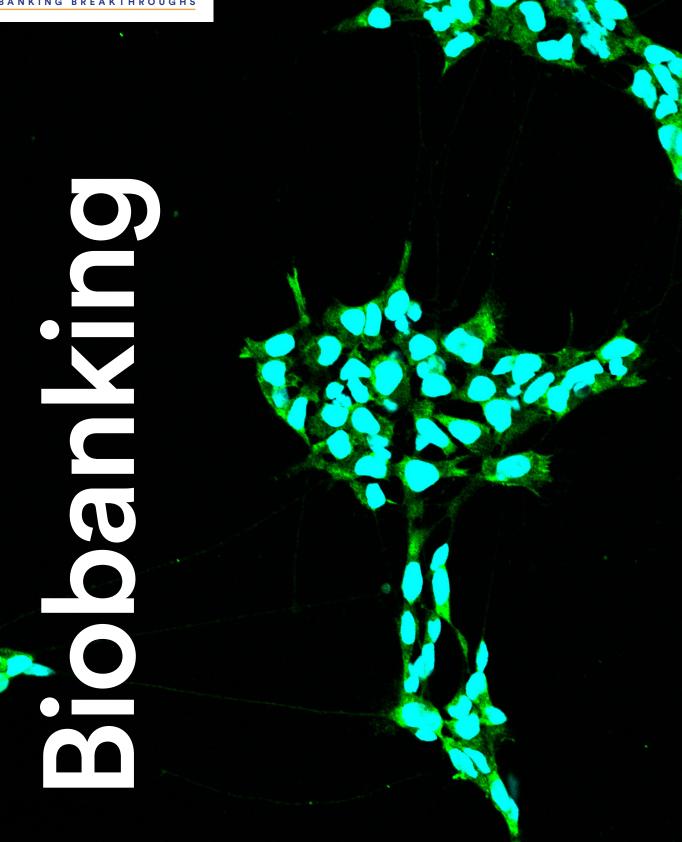
As we expand and become the new Coriell I know we can be, remember this growth is a testament to our unwavering commitment to transforming research and, ultimately, bettering people's lives worldwide. I am filled with excitement and hope for what lies ahead.

JEAN-PIERRE ISSA, MD PRESIDENT & CHIEF EXECUTIVE OFFICER

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Coriell's biobank made enormous strides and hit important milestones last year, continuing the Institute's decades-long legacy of biobanking excellence.

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NIGMS HGCR 50th Anniversary

The National Institute of General Medical Sciences' Human Genetic Cell Repository (NIGMS HGCR) celebrated its 50th anniversary at the Coriell Institute with an in-person event in which leaders of the collection appeared with scientists who have relied on or contributed to this important collection through its many years.



The NIGMS HGCR was founded in 1972 collaboratively between Dr. Lewis L. Coriell, the Institute's founder, and leaders at NIGMS to create a reliable resource of cell lines representing human disease for scientists seeking biomaterials for their research. What started as a paper catalog of a couple dozen pages grew over 50 years to a sprawling online resource indexing thousands of samples of various types. Today, the Repository is one of the world's largest collections of cell lines and DNA representing rare human genetic diseases, as well as global human population diversity, and much more.

"I can't think of many biomedical resources that have lasted this long, and even fewer that have been maintained at the same institution for 50 years," Dr. Judith Greenberg, former Deputy Director of NIGMS, said at the anniversary event. "It was not only visionary to build a repository that would represent the full range of genetic disorders. It was also an altruistic idea because it was designed from the start to address the research missions of many of the NIH institutes."

Over the last twelve months the NIGMS HGCR continued to grow its collection and distribute samples to scientists around the world. Included in the collection are more than 100 induced pluripotent stem cell lines (iPSCs), which are invaluable tools for studying disease, as these cell types can be differentiated (targeted to grow) into nearly any type of cell in the body. The NIGMS HGCR management team at Coriell worked directly with scientists, clinicians, donors, and rare disease advocacy groups to recruit new samples to its collection. In the last year, the team made a special effort working with the National Tay-Sachs & Allied Diseases Association to assist with donor recruitment and blood draws at their family conference. The team also promoted the repository at the Global Genes RARE Patient Advocacy Summit, the National Organization for Rare Disorders (NORD) Rare Diseases and Orphan Products Breakthrough Summit, the American College of Medical Genetics and Genomics (ACMG) Annual Clinical Genetics Meeting, and the Association for Molecular Pathology (AMP) Annual Meeting, and AMP Reference Material Forum.

NINDS Repository 20th Anniversary

The National Institute of Neurological Disorders and Stroke's Human Genetics Resource Center also celebrated its 20th anniversary last year. This collection, housed at Coriell since its creation, contains cell lines, DNA, and extensive de-identified clinical data from thousands of donors diagnosed with a wide range of neurological disorders, including some of the most pressing diseases of our time—stroke, Parkinsonism, dystonia, and many others. It now holds tens of thousands of biological samples and data that is a crucial resource for the study of these diseases and disorders. These accomplishments were highlighted at the annual meeting of the American Society of Human Genetics.

"The NINDS Human Genetics Resource Center is an incredible resource for researchers investigating neurological disorders as well as those studying human health and disease more generally," said Laura Scheinfeldt, PhD, the Principal Investigator of the collection at Coriell and Coriell's Director of Repository Science. "The sheer number of biospecimens in the collection together with the associated clinical data makes this a very special and unique resource."

Pangenome Project

The Coriell team overseeing the NHGRI Sample Repository for Human Genetic Research, sponsored by the National Human Genome Research Institute, played a major role in important publications this year. Coriell was tapped in 2019 to join the new Human Pangenome Reference Consortium (HPRC) to assist with genome sequencing and new sample recruitment. The HPRC's goal is to sequence and assemble a new reference genome from hundreds of individuals (or a pangenome) representing a diverse group of people around the world as an update to the Human Genome Project of the early 2000s.

To date, the HPRC has published several high-impact research papers, including two in the journal *Nature*,

that Matthew W. Mitchell, PhD,

Co-Principal Investigator of the NHGRI Sample Repository at Coriell, served as a co-author on. The first paper, published in October 2022, showcased results from cutting-edge assembly methods for high-quality diploid human reference genomes. The second detailed the first draft of a human pangenome reference and was published in May of 2023.

Aging Cell Repository

The NIA Aging Cell Repository, sponsored by the National Institute on Aging, made available to researchers biological samples from nonhuman primates and this collection of nonhuman primate biomaterials was recently expanded to include 27 unique species, up from 10 previously available. Several species have a broad representation of sex and age. These samples are only available to academic and nonprofit institutions and organizations.

In addition to successfully managing the prominent publicly available repository collections at the Institute, in the last year, Coriell's biobanking team, in collaboration with other departments including the Business Development team, supported many other commercial and/or private collections (both established and newly onboarded), and offered a broad range of laboratory and biobanking services to the scientific community. The biobank also continued to support R&D efforts to innovate, offer additional services, and improve processes to meet growing customer needs, all while maintaining stringent compliance and quality management infrastructure requirements.

How Coriell's Biobanking Logistics Team Maintains Sample Integrity



THE CORIELL Institute for Medical Research is among the most trusted biobanks in the world. The collections in our care represent the most diverse set of biosamples, and we set the gold standard in quality worldwide.

This legacy for biobanking excellence is rooted deep in our history. Our founder, Dr. Lewis L. Coriell, recognized early the need for standardized and reliable biological materials, and he led an effort to develop and improve the many scientific processes that go into full-service biobanking. Our Cell Culture Lab—as well as cell culture labs around the world—still uses techniques and tools developed by Dr. Coriell and his team.

Today at Coriell, one team is responsible for a sample's care from beginning to end—the Biobanking Logistics team. This department manages a complex and wide range of tasks and responsibilities to ensure the samples in our care are received and stored properly, and shipped with care to researchers.

Cyndi Peterson serves as one of the Team Leads for our Biobanking Logistics group. She answered the following questions about how we process, protect, and ship these invaluable samples.

What does the Biobanking Logistics team do at Coriell?

The priority for our department boils down to one thing: sample integrity. Whether it's compiling kit components to receive samples in a safe and compliant way or using advanced equipment to store them, the safety of the samples is priority one. This includes all stages in between, including equipment maintenance, emergency transfers, distributing samples worldwide, and recording storage locations. We perform regular equipment maintenance in order to keep our equipment running efficiently, such as freezer maintenance and defrosting, incubator filter changes, and alarm testing.

Our team is one of only a few at Coriell that sees the process from start to finish. We assemble and ship kits for sample collection, we receive those samples in multiple product types from the labs to freeze or store, and finally, we ship out these samples worldwide for researchers or deliver them internally for further processing.

We are also responsible for keeping the samples organized and stored at the proper temperatures. Each storage device has unique nomenclature for how the samples are stored. It is our job to ensure proper data entry so those samples can be found upon request.

Because we ship our samples all over the nation and across the globe, we have certifications for the proper packaging of biological samples for transport. We renew our certifications regularly and keep up with changes in the interim. We work closely with Customer Service to ensure proper paperwork is in order for international shipments to avoid delays in customs.

We have many different types of samples in the collections in our care. How are each stored?

We store our cell lines either submerged in liquid nitrogen (glass ampoules are stored at -196C) or in the vapor phase of liquid nitrogen (plastic cryovials stored at -150C). DNA is kept in -80C freezers and specimen quality control samples are stored at -20C. Cell pellets & biofluids are stored at -80C. While in process in the labs, samples can be stored anywhere from -196C in transport dewar flasks, up to 37C in the incubators.

We ship samples to scientists in over 80 countries across the world. How is a sample prepared and safely shipped?

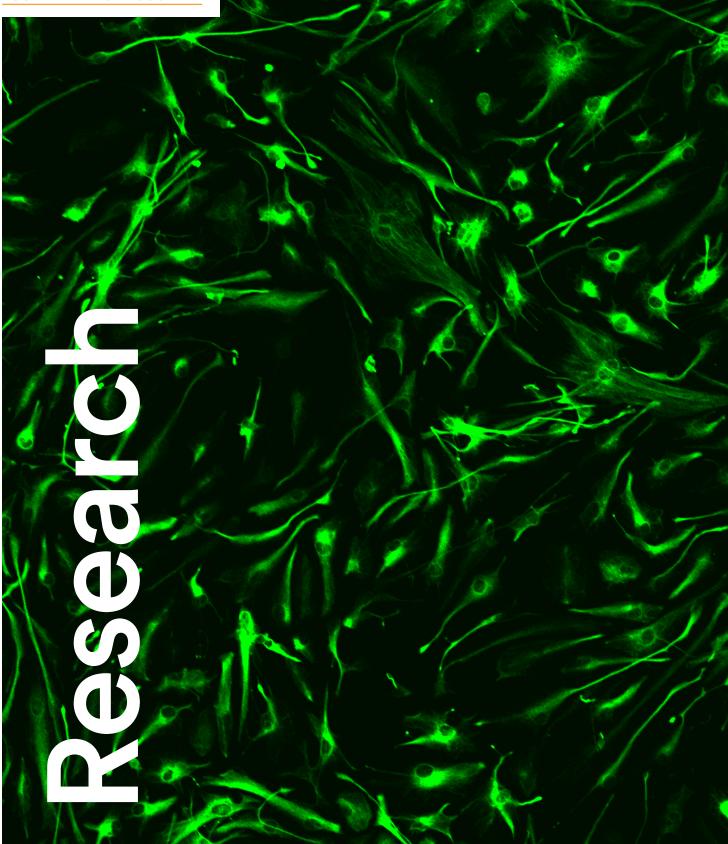
We ship samples at many different temperatures, including frozen (-80C). If a cell line is requested "live" the frozen cell line is delivered to Coriell's Cell Culture Lab by our team for them to thaw and culture to a state where they are viable and safe to ship. The samples are then returned to our team to package and ship according to DOT/IATA regulations.

When samples are requested frozen, our team retrieves the samples, packages them according to DOT/ IATA regulations, and ships them on dry ice. We also ship DNA frozen (upon request). DNA plates, cell pellets, plasmid/protein/antibodies, and biofluids are shipped frozen. We prepare the shipping containers and packaging materials according to regulations and place all necessary labels accordingly.

What would you like scientists ordering from Coriell to know about the Biobanking Logistics team?

Our team understands the importance of the samples in our care. We do everything in our power to maintain the equipment that houses the samples. We package samples for shipment in ways that will keep them safe in transit so they are viable upon delivery. This allows researchers to continue their important work. We monitor the equipment the samples are stored in and respond in the event of a failure to transfer the contents as quickly and as safely as possible, minimizing temperature excursions for the samples. We carefully record data and verify the accuracy for samples we store for efficient relocation.

> "Accuracy is a necessity on our team, and working together, we are successful each day."



It has been an unprecedented year for research at the Coriell Institute, vaulted by the launch of the groundbreaking Camden Cancer Research Center.

ANNUAL REPORT 2023

CCRC

The Camden Cancer Research Center is a three-way collaboration between Coriell, and two of its neighbors in Camden, New Jersey: Cooper University Health Care and the Cooper Medical School of Rowan University. These three organizations have pledged an initial total of \$30 million to fund this center for 10 years.

The organizations bring to the CCRC individual expertise with Coriell's research and biobanking prowess, Cooper University Health Care's oftawarded clinical care and partnership with MD Anderson Cancer Center, and Cooper Medical School of Rowan University's excellent medical education and student research efforts.

"The scientists in this partnership are uniquely positioned to launch this one-of-a-kind effort. They come from a range of backgrounds and expertise but share a goal: learn as much as possible about the complex ways cancer develops in our body so we can prevent or defeat it with new tools and medicines," said Jean-Pierre Issa, MD, Coriell's President and Chief



Executive Officer, who will serve as the inaugural Director for the CCRC. "The foundation of the CCRC offers this group long-term support in their search for new knowledge and their work to translate that knowledge to new treatments."

The Camden Cancer Research Center will also expand the resources and capabilities of the three institutions by creating new facilities with stateof-the-art technology to support this research. Among the new resources, a new biobank will be formed to house and distribute biological samples to scientists in the CCRC and other cancer researchers.

This new cancer center brings together Coriell's existing cancer research under one umbrella. The cancer research team had a highly productive year and their work which detailed cancer biology, improved therapy options, and more was published across many prestigious journals, including *Clinical Cancer Research, Blood, Gastroenterology, Genome Biology,* and others. A list of the team's publications can be found in this report.

New Faculty

In January, Coriell added to its roster of research faculty Xiaoxin Luke Chen, MD, PhD, a highly accomplished scientist with a focus on cancers found in the mouth and throat. Recent work from Dr. Chen's lab has focused on metabolism and cell signaling with regard to esophageal squamous cell carcinoma, a type of cancer that forms in the lining of the esophagus.

But research at Coriell is not limited to cancer.

Coriell Personalized Medicine Collaborative

The Coriell Personalized Medicine Collaborative, a longstanding and wide-ranging personalized medicine study established at Coriell in 2008, continued to bear fruit. Dara Kusic, PhD, a Bioinformatics Research Scientist at Coriell, served as lead author on a study published in **Genetics & Molecular Medicine** which bolstered the links between one's genetics and consumption of caffeine. The paper, titled "Genome-wide Association Study of Caffeine Consumption Using Coriell Personalized Medicine Collaborative Data," detailed how this team of scientists used a genome-wide association study (GWAS) of CPMC data to locate several points on the genome associated with caffeine consumption. Caffeine's near universality makes it a ripe target for further study.

Camden Opioid Research Initiative

Scientists with the Camden Opioid Research Initiative, a research effort made up of the same three organizations as the CCRC, also published in the last year. Their article, titled "Patient Perceptions and the Potential Utility of Pharmacogenetic Testing in Chronic Pain Management and Opioid Use Disorder in the Camden Opioid Research Initiative," demonstrated that a majority of patients in the study are open to genetic testing as part of medication management. This study was published in *Pharmaceutics*.

Featured Publications

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Han J, Liu X, Xu Y, Wang Q, Li L, Du K, Li C, Liu H, Chen Y, Huang J.

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Characterization of Reference Materials for TPMT and NUDT15: A GeT-RM Collaborative Project

Pratt VM, Wang WY, Boone EC, Broeckel U, Cody N, Edelmann L, Gaedigk A, Lynnes TC, Medeiros EB, Moyer AM, Mitchell MW, Scott SA, Starostik P, Turner A, Kalman LV.

The Journal of Molecular Diagnostics. October 2022;24(10):1079-1088. doi: 10.1016/j.jmoldx.2022.06.008. Epub 2022 Aug 2. PMID: 35931342; PMCID: PMC9554816.

Selective CDK9 Inhibition by Natural Compound Toyocamycin in Cancer Cells

Pandey S, Djibo R, Darracq A, Calendo G, Zhang H, Henry RA, Andrews AJ, Baylin SB, Madzo J, Najmanovich R, Issa JJ, Raynal NJ.

Cancers (Basel). July 2022;14(14):3340. doi: 10.3390/cancers14143340. PMID: 35884401; PMCID: PMC9324262.

Genome-wide Association Study of Caffeine Consumption Using Coriell Personalized Medicine Collaborative Data

Kusic D, Zajic S, Gharani N, Gordon E, Schmidlen T, Zhang P, Gerry N, Scheinfeldt L.

Genetics and Molecular Medicine. May 2023; 5(1): 1-10.



As scientists, we at Coriell know that our work is never finished. Each answered hypothesis begets new questions and new paths for further study.

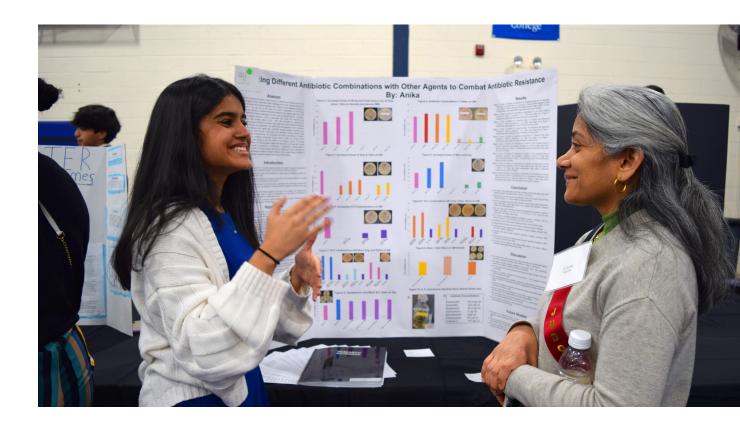
The Coriell Science Fair and Internship Program

At Coriell, we acknowledge our shared responsibility to educate and train the next generation of scientists, those in school now with a passion for uncovering the fundamental truths of our world.

Answering that responsibility, Coriell hosts each year the Coriell Institute Science Fair, open to young scientists across the Institute's region in South Jersey. This year's fair, held in March, was the 42nd such event and brought more than 100 students to Camden County College in Blackwood, New Jersey to show off their scientific curiosity and prowess. The categories for projects range from behavioral science to mathematics, engineering, physics, and more. Winners from this year's fair explored topics such as examining the correlation between sleep duration and students' anxiety levels and school performance and the effects of food preservatives on the microbiome.

These winners were eligible to move on to the regional fair, the Delaware Valley Science Fair, and more than two dozen students that competed in Coriell's fair won awards there.

We also train student scientists right at our facility in Camden, New Jersey, through the Coriell Summer Experience. This is the second year back for the students since the start of the pandemic, during which the program was temporarily replaced by the virtual Bioinformatics Research Experience. A significant change to the Summer Experience this year is that the students had the opportunity to pick a focus for their time at Coriell. Students could choose from working in Coriell's Production Laboratories, with its Research & Development team, or in Project Management, which administers the biobanking collections held at the Institute. The students also had an opportunity to work in Coriell's research labs.



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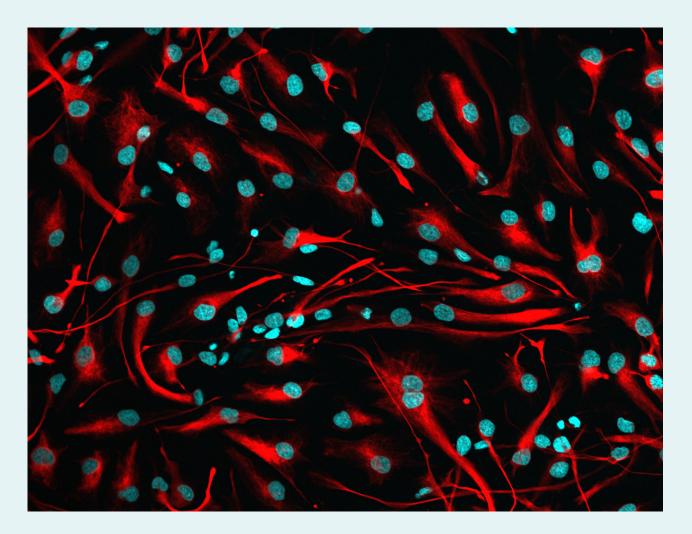
As you've read in this report, Coriell continues to make enormous strides, year after year.

We've built a center for novel cancer research, celebrated decades-long scientific collaborations foundational to genetic research, worked with scientists around the nation on the new human pangenome—a genome that better represents every person on our planet, began planning a stateof-the-art new facility with space to grow, and helped young scientists find their passions through our science fair and internship program. Not bad for a biomedical research organization celebrating its 70th year.

We can do all of this because of the strong support we receive from those who believe in our mission and trust our work: agencies in the National Institutes of Health, fellow academic research institutions, and private disease groups. We also receive funding from local leaders who believe in our work.

And we rely on support from members of the public who share our vision for preventing and curing disease.

If you would like to further support this mission, please contact us at giving@coriell.org.

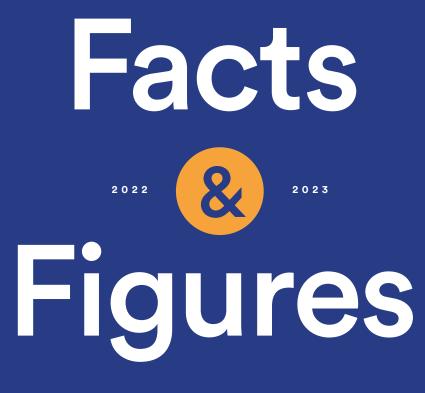


OUR LEGACY

As you've read in this report, Coriell continues to make enormous strides, year after year

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CORIELL INSTITUTE



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PERCENTAGE OF WOMEN TO MEN IN SCIENTIFIC ROLES

61 NUMBER OF SCIENTISTS

2,450 SCIENTISTS SERVED

194 BILLION

CELLS THAT WE'VE CULTURED IN-HOUSE AND SHIPPED 9,027 diseases represented

IN OUR COLLECTION

224

NEW DISEASES ADDED TO OUR COLLECTION 89

COUNTRIES WE'VE SHIPPED TO



RESEARCH PUBLICATIONS THIS YEAR

A Legacy of Innovation. A Future of Possibility.



SINCE 1953

