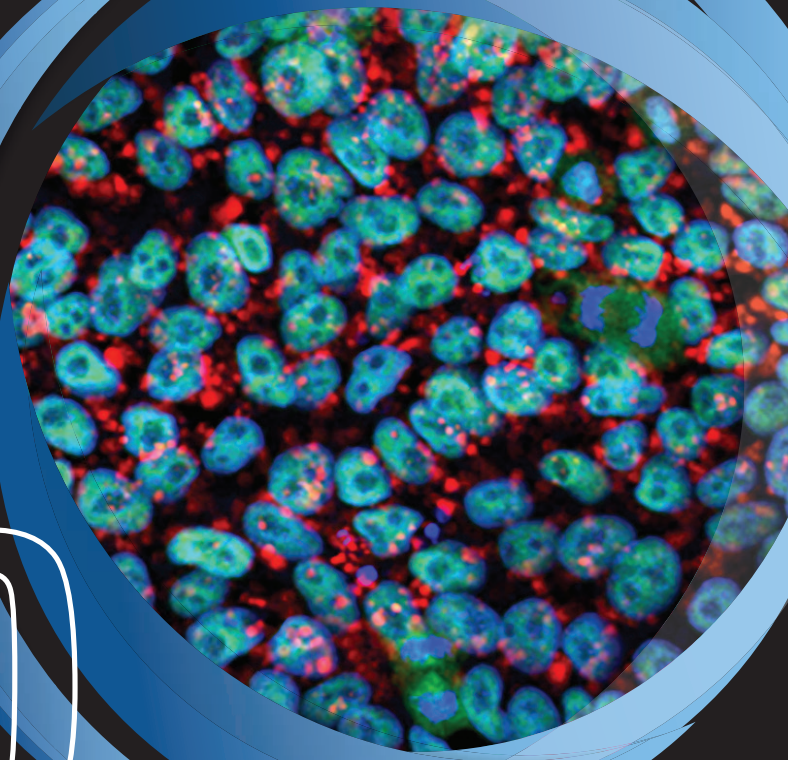
ANNUAL REPORT



2020

MMRI
Masonic Medical Research Institute

Cover image, taken by Saravanakkumar Chennappan, Ph.D., Postdoctoral Fellow in the Kontaridis Lab, shows pluripotency markers for inducible pluripotent stem cells (iPSCs). The Kontaridis lab can transition adult cells from patients with a particular disorder to iPSC embryonic cells. They are then transformed into any human cell type of interest, such as brain or heart cells, and used to study a particular disease and find ways to prevent or reverse its consequence.

MISSION STATEMENT

The Masonic Medical Research Institute (MMRI) is dedicated to improving the health and quality of life for all humankind. The Institute's primary mission is to conduct high quality basic biomedical and clinical research aimed at generating knowledge and information necessary for understanding molecular mechanisms of disease and development of medical cures and treatments of tomorrow. The Institute is also committed to providing education and training to basic scientists, clinical researchers and students who will perpetuate and extend the fight against disease worldwide.

VISION STATEMENT

The Institute's vision is to build scientific teams that can combine molecular biology, chemistry, computation, technology and engineering to create novel approaches to understanding and deciphering causes of disease. Using this knowledge, we will advance basic research to clinical application, therapeutics and cures. To this end, the Institute will foster an environment of creativity, risk-taking, and open sharing of data and research. Finally, this new model will seek collaborations, both within the Institute and worldwide, in our mission to combat disease.

VALUES

i) Propelling the understanding of medical science through innovation and groundbreaking research and investigation.
ii) Fostering teamwork and collaboration, institutionally and worldwide, to combat disease.
iii) Empowering scientists to take risks and act boldly on ideas with transformative potential.
iv) Sharing of ideas, data and knowledge to drive biomedical progress, therapeutics and cures.
v) Building an inclusive community.

RESEARCH

The MMRI continues to pave the way towards new discoveries. In 2020, our research scope expanded to include projects focused on COVID-19. We moved forward with advancements in the fields of electrophysiology, cardiac development, genetics, cardiac hypertrophy and failure, diabetes and obesity, autism and autoimmune disease.
In addition, with the completion of Phase II renovations, and the prospect of Phase III now on the horizon, our team is well-poised to raise the bar on our capabilities and competitiveness, both nationally and internationally. Our cutting-edge technologies, including the use of inducible pluripotent stem cells, genome editing, nanotechnology, single-cell RNA sequencing, and virus-based drug delivery systems, allow us to identify new ways to understand and develop targeted and individualized therapies, enabling the MMRI to be at the forefront of scientific discovery.

SCIENTIFIC RECOGNITION

Since its founding in 1958, the MMRI has gained international recognition. As the Institute has grown in prominence, members of the scientific staff have received numerous invitations to present their research findings worldwide. MMRI publications have appeared in the most prestigious medical and scientific journals in the world, and as a result, the MMRI has received significant media coverage locally and across the country.

FUNDING

Funding is critical for providing the vital financial resources needed to conduct the innovative research at MMRI. Total research grant revenue for this year, despite the pandemic, was just over $2.5M, while philanthropic support from our brothers, board members, faculty, staff, and friends provided an additional $2.7M, including generous donations from the estate of the late Brs. Franklin O.L. Steinberg and Stephen N. Steinberg and from the Royal Arch Medical Research Foundation. The pandemic did also provide the Institute some unexpected revenue. MMRI received a Federal Paycheck Protection Program loan totaling over $637K, which was formally forgiven in December 2020, and MMRI researchers were able to provide COVID-19 testing services for Mohawk Valley Health Systems, providing an additional $2.4M in revenue.

EDUCATION

Educational programs offered at MMRI include Summer Fellowship, Undergraduate, Predoctoral, and Postdoctoral Fellow Training Programs.

FACULTY AND STAFF

The Institute's faculty, postdoctoral fellows, technicians, students and visiting scholars are all part of a world-class team of scientists working together to improve the quality of life for all. They serve on advisory boards of both State and Federal governmental agencies, as well as editorial boards of scientific journals. The administrative and support staff consist of dedicated individuals who are devoted to furthering the success of the Institute.

BOARD OF DIRECTORS

The MMRI is administered by a Board of Directors and the Executive Director. The Board of Directors consists of up to 15 distinguished Masons elected to three-year terms and serve without compensation.

BOARD OF DIRECTORS 2020

These Brethren, nominated by the Grand Master and elected by vote of Grand Lodge at its Annual Communication, are chosen because of their unique qualifications to administer the affairs of the Masonic Medical Research Institute, based upon their outstanding business and professional experience.

David F. Schneeweiss, *Chairman of the Board*
Alvaro F. Quiroga-Sanchez, *President*
Robert A. Hewson, DPM, *Vice-President*
James D. Swan, Jr., *Secretary*
Vincent Cunzio, CPA, *Treasurer*

Michael A. Chaplin, M.D.
David D. Goodwin
Peter R. Gray, M.D., Ph.D., FACC
Paul A. Guerrero, CMR
Pasquale Imbimbo, Jr.
Richard J. Miller, Jr., ESQ.
Virgilio S. Quijano
Sheldon B. Richman, ESQ.
Francesco Santoni-Rugiu, M.D.
Laurence I. Sussman

EMERITUS

John P. Chang, R.Ph.
Paul N. O'Neill
Victor G. Webb
Albert J. Wright, III

MMRI Board of Directors (Back row, left to right): Laurence I. Sussman; Virgilio S. Quijano; David D. Goodwin; Sheldon B. Richman, ESQ.; Paul A. Guerrero, CMR; Pasquale Imbimbo, Jr. (Front row, left to right): Vincent Cunzio, CPA, Treasurer; David F. Schneeweiss, Chairman of the Board; Alvaro F. Quiroga-Sanchez, President; Robert A. Hewson, DPM, Vice-President; James D. Swan, Jr., Secretary. (Not pictured above): Michael A. Chaplin, M.D.; Peter R. Gray, M.D., Ph.D., FACC; Richard J. Miller, Jr., ESQ.; Francesco Santoni-Rugiu, M.D.

REPORT FROM THE BOARD OF DIRECTORS PRESIDENT

To the Grand Lodge:

The Masonic Medical Research Institute (MMRI), a leader of scientific innovation for over 60 years, was built on the promise of improving life for all of humankind. Founded by the faithful Brothers of the Masonic Fraternity, the MMRI has been at the forefront of medical discovery, advancing what we know and always eager to go further. I am proud to speak for and represent the MMRI, who, despite the uncertainty and fear encompassing this year, have adapted, and prevailed to not only continue the great work we are known for, but step up to the challenges 2020 set before us.

When our country and community met the sudden impact of COVID-19, the MMRI quickly responded with initiatives to help. Mr. Ryan Pfeiffer, Research Associate, Ms. Mayurika Desai, Research Assistant, and Dr. Saravanakkumar Chennappan, hand-made face masks and hair bonnets for local healthcare workers. Soon thereafter, Mr. Pfeiffer and Ms. Desai joined Drs. Nathan Tucker and Michelle Hulke, on a team designated to conduct the PCR testing for the Mohawk Valley Health System (MVHS). After partnering with the MMRI, MVHS, who was experiencing long turnaround times of up to 3 or more days for their results is now receiving them in as little as 10 hours.

In addition, several faculty members responded to the unknowns of the virus by pivoting their work to include projects based solely on the understanding of COVID-19 and its short-term and long-term effects. And as if all of that was not enough, in November, the MMRI evaluated the needs of their community and began the process to procure authorization for running a rapid COVID-19 testing site; operations of which opened in early 2021. We were also contacted by the Oneida County Department of Health and the MVHS about potentially storing the COVID-19 vaccines. The Institute is one of the only facilities within the area to have ultra-low temperature freezers, necessary to store the vaccine. While no partnerships have yet been established, we volunteer this service should the need arise.

Even though the pandemic stood at the forefront, the MMRI forged ahead with other endeavors and projects. Phase II of the multi-year renovation project was completed in the Summer of 2020. The final portion being the addition of a medical procedural suite and science laboratories located on the basement level. These additions will allow for our science team to continue their research in appropriate space, as well as make room for the ever-growing MMRI team. I thank Brother James D. Swan Jr., Secretary of the MMRI Board of Directors, for leading the Building and Grounds committee and ensuring the success of the renovations. I also extend this thank you to the dedicated team at VIP Structures for helping us bring our dreams to reality, and to Mr. Curt Fowler, Facilities Manager, for overseeing the construction.

Additionally, I thank the entire MMRI team for their unwavering dedication to our mission, community, and science. It has truly been inspiring to witness the leadership of Dr. Maria I. Kontaridis, and to see firsthand how she has guided the Institute's efforts during these unprecedented times. None of which would have been possible without our generous Brothers within the Masonic Fraternity, our friends of the Fraternity, the Order of the Eastern Star and the Royal Arch Masons, and the community of supporters both local and far.

The MMRI employees, from science to administration, have gone above and beyond this year, and I am proud to serve as the President of the Board of Directors for such an outstanding institution, with outstanding individuals. I extend a special thank you, to the Grand Master M.∴W.∴ William M. Sardone, Deputy Grand Master R.∴W.∴ Richard J. Kessler, and the entire Grand Line for their indelible support of the MMRI this year and always. I look forward to 2021 with excitement, knowing, the future will surely exceed expectations.

Sincerely and Fraternally,

R.∴W.∴ Alvaro F. Quiroga-Sanchez
President, MMRI Board of Directors

The Board of Directors practiced proper social distancing protocols this year. Cardboard cutouts of the members of the Board were featured in the audience of Grand Master's telethon fundraising event in December. Now, the portraits sit in the MMRI Ernest Leonardi Board Room, waiting for the return of in-person meetings.

BIOMEDICAL RESEARCH AND TRANSLATIONAL MEDICINE 2020

Through the years, the Institute has remained at the forefront of scientific discovery. MMRI scientists continue to seek new knowledge essential for the progress of medical science. The outstanding accomplishments and achievements realized by our team this year is a devotion to the earnest pursuit of scientific discovery through basic experimentation.

SCIENTIFIC LEADERSHIP

Maria I. Kontaridis, Ph.D.
Executive Director
Gordon K. Moe Professor and Chair of Biomedical Research and Translational Medicine
Director of Research
Molecular Cardiology and Signaling

RESEARCH FACULTY

Jason McCarthy, Ph.D.
Scientific Operations Manager
Associate Professor
Imaging and Nanomedicine

Gary Aistrup, Ph.D.
Research Assistant Professor
EC Coupling and Electrophysiology

Ademuyiwa Aromolaran, Ph.D.
Assistant Professor
Metabolism and Cardiac Channelopathies

Jonathan M. Cordeiro, Ph.D.
Assistant Professor
Electrophysiology and Cardiac Arrhythmias

Adife Gulhan Ercan-Sencicek, Ph.D.
Instructor
Autism and Molecular Genetics

Chase Kessinger, Ph.D.
Instructor
Pulmonary Embolism and Venous Thrombosis

Zhiqiang Lin, Ph.D.
Assistant Professor
Diabetes and Obesity

Coralie Poizat, Ph.D.
Research Associate Professor
Cardiomyopathy and Heart Failure

Nathan Tucker, Ph.D.
Assistant Professor
Genomic Decryption

Sathya Unudurthi, Ph.D.
Instructor
Cardiac Inflammation

SCIENTIFIC CORES

Animal Care
Damian Bohler, LATG
Animal Facilities Manager

Laura Coon
Animal Care Assistant

Kaitlin Perez, LVT
Animal Care Assistant I

Electrophysiology
Robert Goodrow, Jr.
Electrophysiology Core Manager

Fluorescence-activated Cell Sorting (FACS)
Sathya Unudurthi, Ph.D.
FACS Core Manager

Gene Therapy
Zhiqiang Lin, Ph.D.
Gene Therapy Core Manager

Genetics
Nathan Tucker, Ph.D.
Genetics Core Manager

Ryan Pfeiffer
Genetics Core Co-Manager

Mayurika Desai
Research Assistant

Histology/Imaging/Surgery
Chase Kessinger, Ph.D.
Histology/Imaging/Surgery Core Manager

Rena Collandra
Research Assistant

POSTDOCTORAL FELLOWS

Joyce Bernardi, Ph.D.
Saravanakkumar Chennappan, Ph.D.
Khanh Ha, Ph.D.
Muthunarayanan Muthiah, Ph.D.
Jagathesh (Bose) Rajendran, Ph.D.
Yan Sun, Ph.D.
Bing Xu, Ph.D.

RESEARCH ASSOCIATES

Kelly Aromolaran, Ph.D.
Michelle Hulke, Ph.D.
Ryan Pfeiffer

RESEARCH ASSISTANTS

Rena Collandra
Mayurika Desai
Jenny Do
Emily Frisa
Maya Hammonds
Pamela Lawrence
Taylor Lawton
Levi Legler
Steven Negron
Jacqueline Treat

SCIENTIFIC ADMINISTRATIVE SUPPORT

Terri Cronin
Executive Assistant to the Director of Research Board Support

Jessica Densten
Administrative Assistant

Lisa Ingerham
Faculty Administrative Assistant

AFFILIATED FACULTY

Ben Boivin, Ph.D.
SUNY Poly-Albany

Zhen Ma, Ph.D.
Syracuse University

Jennifer Peterson, Ph.D.
University of Toledo

VISITING SCHOLAR

Yunan Gao, Ph.D.

COMPLIANCE OFFICER

Kelé Piper

REPORT FROM THE EXECUTIVE DIRECTOR

To the Grand Lodge:

We can all agree with certainty that 2020 unfolded in a way none of us could have ever imagined. In the wake of the most devastating health crisis of our lifetimes, Masonic Medical Research Institute (MMRI) demonstrated unwavering commitment to serving humanity. Between outreach to the local community and cutting-edge research that led to advancements of science across the globe, the Board of Directors, scientists, and staff at MMRI stayed true to their mission: advancing the health and quality of life for all humankind. This year, more than ever, this team showed dedication, leadership, determination, and most importantly, resilience. I could not be more proud to be a part of such an amazing organization.

MMRI's underlying philosophy, to understand mechanisms of disease, to uncover cures and treatments, and to train and educate rising scientists, has not changed in the 62 years of our history. We stand on the foundation of these convictions and conduct innovative science that has lasting impact. Our research has consequently achieved great success, getting recognized across the country not only for its strength in cardiovascular disease, but also for its efforts in new areas of study, including autism and lupus.

Of course, none of this is possible if not for the generosity and support of our philanthropy. In 2020, we received over $2.7M from our circle of 829 supporters, including over $2M from the Franklin O.L. and Stephen N. Steinberg Trust. In addition, our scientists brought in $2.6M in highly competitive federal grant and foundation research awards, including from the National Institutes of Health, the Department of Defense, and American Heart Association. Together, these contributions from fellow Masons, friends, faculty, staff, federal funding agencies, foundations, and corporations have been wide-ranging and hugely impactful, enabling us to establish research programs focused on combating cardiovascular disease, obesity and diabetes, autism, autoimmunity, cancer, and now COVID-19.

As you all may be aware, over the last three years, MMRI has been undergoing an aggressive growth and expansion phase. Since 2018, MMRI has brought in highly talented, world-renowned scientists and staff to Upstate New York. Indeed, we are now over 50 people, with 31 scientists and 20 administrative staff! In addition, despite the pandemic, we completed our Phase II renovation project this year, outfitting our basement level with a new procedural suite and state-of-the-art research bench space for our scientists. This endeavor could not have been possible if not for the vision and dedication of R:.W:. James Swan, Jr., our Board of Director's Secretary and Building and Grounds Committee Chair, and Mr. Curt Fowler, our MMRI Facilities Manager. In addition, a generous gift from R:.W:. David Schneeweiss, the Chairman of our Board of Directors, allowed us to complete our beautiful veranda on the 2nd floor, a space created to foster networking and scientific discussion for our MMRI team. Going forward, plans are underway to continue construction in Phase III, for which we received a $668,980 grant from New York State and Empire State Development, to renovate the Genetics wing of our building. Once completed, we will have renovated every square inch of our current footprint in Utica, NY, paving the way for thinking about a new building or space to accommodate our growing research endeavors.

In this regard, even in the midst of crisis, our faculty research programs had tremendous impact this year. Some of our scientists pivoted their efforts to assist in the understanding of mechanisms causal to severe COVID-19 infection. Specifically, with studies showing that 30% of COVID patients experience blood clots, Dr. Chase Kessinger, an investigator working to understand causes of pulmonary embolism, began looking at the relationship between the virus and blood clots. Likewise, Drs. Sathya Unudurthi, Nathan Tucker, and Zhiqiang Lin centralized their COVID research on cardiac complications, finding that 20-25% of all COVID-related deaths are due to underlying cardiac disease. Their work additionally addressed the role of genetics in infection severity and how gene variants might increase or decrease susceptibility of individuals to the virus. Finally, Dr. Jason McCarthy, in collaboration with Dr. Benoit Boivin at SUNY Poly Albany, focused on whether drugs could be specifically targeted to the heart to prevent COVID-19 viral replication, to limit the cardiac damage caused by such infections.

In addition, to assist our community with the pandemic, in June 2020, MMRI began conducting quantitative PCR COVID-19 testing in Utica, which resulted in an incredible partnership with the Mohawk Valley Health System (MVHS), which make up our local hospitals. We were able to "create a local solution to a national problem," as stated by Darlene Stromstad, President/CEO of MVHS. Our qualified team, consisting of Drs. Nathan Tucker and Michelle Hulke, Mr. Ryan Pfeiffer, and Ms. Mayuri Desai, have been working tirelessly on these efforts, processing several hundred COVID-19 tests per week at our facility. Furthermore, in November, we also became a rapid testing site, only the third at that time for the whole of Oneida County. Finally, we had the opportunity to participate in several webinars hosted by Grand Master William Sardone, where we had the opportunity to discuss COVID-19 and answer any questions fellow Masons had in this regard. We are grateful to have had the opportunity to give back in such an impactful way and are thankful to be a part of such a great community.

Besides COVID-19, our primary research projects have also progressed successfully this year, despite the starts and stops of this pandemic. Firstly, together with Dr. Gulhan Ercan-Sencicek, I received a new three-year $300,000 Transformational Project Award from the American Heart Association for research focused on understanding how specific genetic mutations differentially affect heart and brain development. In addition, thanks to a $120,000 grant award by Onconova Pharmaceuticals, my lab is also working on understanding ways to treat heart disease in children with specific genetic mutations. Dr. Jason McCarthy, as part of his collaboration with Harvard Medical School, received 3 multi-year grants from the National Institutes of Health, one focusing on the role of inflammation in deep vein thrombosis, one on the development of atherosclerosis, and the other on cellular angiogenesis. Together, these grants total over $400,000! As well, Dr. Nathan Tucker, in collaboration with Columbia University, received an American Heart Association Innovative Project Award focused on the role of atrial fibrillation in heart dysfunction, efforts that total near $50,000. All these grants are in addition to the more than $6M multi-year grants our investigators have already previously secured for MMRI! Most excitingly, this hard work by our faculty, postdoctoral fellows, research associates and assistants have culminated in the publication of 32 manuscripts this year, in top-tier, peer-reviewed scientific journals, increasing our nationwide research excellence in areas such as cardiac arrhythmias, heart disease, and heart failure.

Finally, one of the most important jobs we have at MMRI is to inspire and encourage young people to pursue careers in STEM based programs. As part of our commitment to building an infrastructure of independent thinkers and to help promote the growth and curiosity of budding scientists, we created the *Halfond-Weil Postdoctoral Fellowship*. Thanks to a generous endowment provided by the 8th Manhattan Lodge in New York City, this fellowship provides an annual $50,000 award for a top-talented MMRI postdoctoral fellow. This year we are pleased to award this fellowship to Dr. Jagathesh Chandra Bose Rajendran, a postdoctoral fellow in the McCarthy Lab, who's project focuses on targeting organ/tissue-specific immune cells to develop therapeutics for autoimmune disorders.

In closing, our 62-year history encapsulates tremendous achievements, which have lent themselves to the development and/or implementation of critical devises and therapies utilized around the world, including the pacemaker, implantable cardioverter defibrillator, automatic external defibrillator, catheter ablation therapy and a wide variety of drugs used to treat heart disease. MMRI is one of only a handful of institutes whose research has been this influential and essential to the study of experimental cardiology. In the last decade, such treatment strategies have saved countless lives. As our impact worldwide continues to grow, along with our research portfolio, so will the importance of our work, again thanks to you. The first 62 years at MMRI only set the stage for our next 62, years we are confident will yield extraordinary new discoveries that will bring life-saving benefits to us all.

Sincerely and with gratitude,

Maria Kontaridis

Maria I. Kontaridis, Ph.D.
Executive Director

ADMINISTRATION 2020

ADMINISTRATIVE LEADERSHIP

Susan A. Bartkowiak
Director of Administration, Grants Administrator

Lisa Cooper, CPA
Controller

Varun Balaji
Information Technology Director

Curt Fowler
Facilities Manager

Amy Pietrafesa, SPHR
Director of Human Resources

ADMINISTRATIVE TEAM

Kayliegh Caruso
Marketing and Communications Associate

Anthony Ciaccia
Maintenance Technician

Ed Colon
Lead Maintenance Mechanic

Hillary Cote
Development Data Analyst

Anthony Cucci
Fraternal Relations & Development Associate

John DeMarco
Senior Maintenance Technician

Nermin Dizdarevic
Information Technology Assistant

Curt Fowler
Facilities Manager

Edin Hasic
Security

Justin Izzo
Procurement and Contracts Coordinator

Crystal Jadwick
Payroll and Benfits Administrator

Tom Lloyd
Facilities Associate

Michael Mayo
Senior Accountant

Christina Poplaski
Receptionist

Tabitha Poplaski
Human Resources Associate

John Salvati
Senior Accountant

Sharon Scanlon
Visas/Copy Editor

David Stiles
Senior Director of Major & Principal Gifts

Richard Thomas
Security

Victoria Wenke
Marketing and Communications Assistant

REPORT FROM THE CONTROLLER

To the Grand Lodge:

As we all know, the pandemic has changed many aspects of our lives both at home and in the workplace. While the MMRI was considered an essential business and therefore able to continue our research, the pandemic's affects were still felt by each of us. Potential grant funding was reduced and what was available became much more competitive. Despite limited funding opportunities, our faculty continues to submit impressive grant proposals that, if funded, will allow us to continue to conduct our innovative research, potentially leading to ground-breaking discoveries. In addition to grant funding, we are always grateful for the generosity of the Masonic Fraternity and local communities.

Despite the pandemic, Administration did our part to keep the science moving forward. Administration switched to a fully remote working schedule, while science staff staggered their shifts to ensure the continuation of the research in a safe manner. Phase II of our multi-year construction project was temporarily put on hold but was successfully completed in November. We now look forward to beginning the last phase of the construction/remodeling of the Institute with the Phase III - Genetics Wing - renovations. While this final project too has been delayed, we have secured the funding proposal from the New York Empire State Development (ESD) Council that will provide the necessary resources to complete the modernization of our 60-year-old building. Final drawings are in the process of being completed, with construction slated to begin in the fall of 2021. While we celebrate these achievements and bid farewell to a most memorable 2020, we look forward to 2021 with a renewed sense of purpose and enthusiasm for the vital research that is being conducted by our scientists.

Financially, the pandemic provided some unexpected opportunities that offset lower contribution rates and grant revenues. To support the local healthcare system, MMRI contracted with Mohawk Valley Health Systems (MVHS) to provide Covid-19 testing services for their patients. This arrangement provided MVHS with affordable, reliable, and fast testing services which allowed them to better serve patients, resume non-emergency surgeries, and provide necessary virus data to the Department of Health. Since testing started in June 2020, over $2.4M in revenue was earned for these services providing needed resources not previously expected. Additionally, the MMRI received a Federal Paycheck Protection Program (PPP) loan for over $637k, which was formally forgiven in December 2020. The budget for 2021 is balanced and anticipates sustainable cash flow, however, without increasing revenue sources this may not be the case in future years.

The MMRI Administration team increased our footprint by expanding our staff numbers as well as our capacity to provide top level support to the Executive Director, Board, Scientists, and other stakeholders. Investment in personnel and technology is a continuing goal of the MMRI as memorialized in its 2021-2025 Strategic Plan. To that end, the Administrative team is confident that eminent future growth and upcoming initiatives will be managed with efficiency and provide leadership with peace of mind as they continue to advance the goals of the Institute.

Sincerely,

Lisa Cooper, CPA
Controller

MASONIC MEDICAL RESEARCH INSTITUTE

FINANCIAL STATEMENTS

DECEMBER 31, 2020

Lumsden McCormick LLP
CERTIFIED PUBLIC ACCOUNTANTS

Cyclorama Building | 369 Franklin Street | Buffalo, NY 14202

p: 716.856.3300 | f: 716.856.2524 | www.LumsdenCPA.com

INDEPENDENT AUDITORS' REPORT

The Board of Directors
Masonic Medical Research Laboratory,
dba Masonic Medical Research Institute

We have audited the accompanying balance sheets of Masonic Medical Research Laboratory, dba Masonic Medical Research Institute (the Institute) as of December 31, 2020 and 2019, and the related statements of activities, functional expenses, and cash flows for the years then ended, and the related notes to the financial statements.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation and fair presentation of these financial statements in accordance with accounting principles generally accepted in the United States of America; this includes the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of financial statements that are free from material misstatement, whether due to fraud or error.

Auditors' Responsibility

Our responsibility is to express an opinion on these financial statements based on our audits. We conducted our audits in accordance with auditing standards generally accepted in the United States of America and the standards applicable to financial audits contained in *Government Auditing Standards*, issued by the Comptroller General of the United States. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditors' judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. Accordingly, we express no such opinion. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Opinion

In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of the Institute as of December 31, 2020 and 2019, and the changes in its net assets and cash flows for the years then ended, in accordance with accounting principles generally accepted in the United States of America.

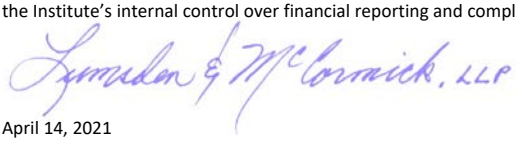
Supplementary Information

Our audit was conducted for the purpose of forming an opinion on the financial statements as a whole. The accompanying schedule of expenditures of federal awards required by Title 2 U.S. *Code of Federal Regulations* Part 200, *Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards*, is presented for purposes of additional analysis and is not a required part of the financial statements.

The accompanying schedule of expenditures of federal awards is the responsibility of management and was derived from and relates directly to the underlying accounting and other records used to prepare the financial statements. Such information has been subjected to the auditing procedures applied in the audit of the financial statements and certain additional procedures, including comparing and reconciling such information directly to the underlying accounting and other records used to prepare the financial statements or to the financial statements themselves, and other additional procedures in accordance with auditing standards generally accepted in the United States of America. In our opinion, the information is fairly stated, in all material respects, in relation to the financial statements as a whole.

Other Reporting Required by *Government Auditing Standards*

In accordance with *Government Auditing Standards*, we have also issued our report dated April 14, 2021 on our consideration of the Institute's internal control over financial reporting and on our tests of its compliance with certain provisions of laws, regulations, contracts, grant agreements, and other matters. The purpose of that report is to describe the scope of our testing of internal control over financial reporting and compliance and the results of that testing, and not to provide an opinion on internal control over financial reporting or on compliance. That report is an integral part of an audit performed in accordance with *Government Auditing Standards* in considering the Institute's internal control over financial reporting and compliance.



April 14, 2021

MASONIC MEDICAL RESEARCH INSTITUTE

Balance Sheets

December 31,	2020	2019
Assets		
Current assets:		
Cash	**$ 1,401,317**	$ 227,506
Receivables (Note 2)	**3,071,059**	3,919,910
Prepaid expenses and other assets	**213,524**	110,659
	4,685,900	4,258,075
Investments (Note 3)	**28,899,883**	32,777,186
Charitable gift annuities (Note 4)	**368,399**	356,128
Property and equipment, net (Note 5)	**16,994,343**	14,331,703
Cash value of life insurance	**1,048,144**	1,011,282
	$ 51,996,669	$ 52,734,374
Liabilities and Net Assets		
Current liabilities:		
Current portion of long-term debt (Note 6)	**$ 11,943,158**	$ -
Accounts payable	**488,357**	335,443
Accrued expenses	**389,197**	191,200
Deferred revenue	**16,066**	-
	12,836,778	526,643
Long-term debt (Note 6)	**-**	11,239,986
Charitable gift annuities (Note 4)	**149,518**	157,457
Net assets:		
Without donor restrictions	**31,144,256**	33,000,662
With donor restrictions (Note 8)	**7,866,117**	7,809,626
	39,010,373	40,810,288
	$ 51,996,669	$ 52,734,374

See accompanying notes.

MASONIC MEDICAL RESEARCH INSTITUTE

Statements of Activities

For the years ended December 31,	2020	2019
Net assets without donor restrictions:		
Revenues, gains and support:		
Contributions:		
Masonic Brotherhood Foundation, Inc.	**$ 105,587**	$ 123,065
Legacies and bequests	**690,767**	3,636,897
Grants	**2,029,171**	2,811,994
Other	**330,554**	273,983
Laboratory service fees	**2,453,912**	-
Paycheck Protection Program loan forgiveness (Note 7)	**637,290**	-
Investment earnings, net	**645,033**	4,186,877
Other income	**7,106**	867
Net assets released from restrictions	**318,676**	186,284
Total revenues, gains, and support	**7,218,096**	11,219,967
Expenses:		
Program services - research and education	**6,586,479**	5,636,256
Management and general	**1,983,135**	1,491,185
Public relations and development	**504,888**	648,609
Total expenses	**9,074,502**	7,776,050
Change in net assets without donor restrictions	**(1,856,406)**	3,443,917
Net assets with donor restrictions:		
Contributions	**74,024**	228,544
Investment earnings, net	**301,143**	1,053,843
Net assets released from restrictions	**(318,676)**	(186,284)
Change in net assets with donor restrictions	**56,491**	1,096,103
Change in net assets	**(1,799,915)**	4,540,020
Net assets - beginning	**40,810,288**	36,270,268
Net assets - ending	**$ 39,010,373**	$ 40,810,288

See accompanying notes.

Statements of Functional Expenses

For the years ended December 31,	2020			
	Program Services	Supporting Services		
	Research and Education	Management and General	Public Relations and Development	Total
Salaries	$ 2,398,005	$ 1,070,715	$ 253,143	$ 3,721,863
Payroll taxes and fringe benefits	600,629	238,352	49,380	888,361
Total salaries and related expenses	2,998,634	1,309,067	302,523	4,610,224
Research expenses	1,526,099	-	-	1,526,099
Buildings and grounds operations	166,323	42,580	6,570	215,473
Equipment and repairs	183,792	47,534	2,842	234,168
Office expenses	53,554	95,135	31,156	179,845
Conferences, travel and meals	26,478	34,583	22,569	83,630
Professional fees and outside services	88,223	234,331	50,442	372,996
Publicity, promotion and sponsorships	7,534	16,366	63,493	87,393
Insurance	41,753	28,543	1,792	72,088
Depreciation	1,288,157	106,145	14,990	1,409,292
Interest	205,566	53,948	6,818	266,332
Miscellaneous	366	14,903	1,693	16,962
	$ 6,586,479	$ 1,983,135	$ 504,888	$ 9,074,502

See accompanying notes.

	2019			
	Program Services	Supporting Services		
	Research and Education	Management and General	Public Relations and Development	Total
	$ 2,368,876	$ 589,929	$ 320,566	$ 3,279,371
	514,538	114,588	55,636	684,762
	2,883,414	704,517	376,202	3,964,133
	820,297	-	-	820,297
	88,786	35,744	4,386	128,916
	27,809	6,755	172	34,736
	23,046	31,756	95,806	150,608
	95,943	54,230	45,401	195,574
	269,071	265,560	45,246	579,877
	1,903	4,304	48,272	54,479
	34,474	31,774	2,324	68,572
	1,094,550	145,233	6,765	1,246,548
	296,963	154,737	3,276	454,976
	-	56,575	20,759	77,334
	$ 5,636,256	$ 1,491,185	$ 648,609	$ 7,776,050

MASONIC MEDICAL RESEARCH INSTITUTE

Statements of Cash Flows

For the years ended December 31,	2020	2019
Operating activities:		
Change in net assets	**$ (1,799,915)**	$ 4,540,020
Adjustments to reconcile change in net assets to net cash flows from operating activities:		
Paycheck Protection Program loan forgiveness	**(637,290)**	-
Depreciation	**1,409,292**	1,246,548
Net realized and unrealized gains on investments	**(224,651)**	(4,213,863)
Increase in cash value of life insurance	**(36,862)**	(35,937)
Charitable gift annuities	**(20,210)**	(40,508)
Changes in other operating assets and liabilities:		
Receivables	**848,851**	(2,586,904)
Prepaid expenses and other assets	**(102,865)**	(31,875)
Accounts payable	**152,914**	(83,889)
Accrued expenses	**197,997**	105,229
Deferred revenue	**16,066**	-
Net operating activities	**(196,673)**	(1,101,179)
Investing activities:		
Property and equipment purchases	**(4,071,932)**	(2,093,169)
Proceeds from sales of investments	**10,367,149**	5,735,631
Purchases of investments	**(6,265,195)**	(3,415,819)
Net investing activities	**30,022**	226,643
Financing activities:		
Proceeds from Paycheck Protection Program loan	**637,290**	-
Payments on long-term debt	**(999,121)**	-
Proceeds from issuance of long-term debt	**1,702,293**	837,738
Net financing activities	**1,340,462**	837,738
Net change in cash	**1,173,811**	(36,798)
Cash - beginning	**227,506**	264,304
Cash - ending	**$ 1,401,317**	$ 227,506

See accompanying notes.

Notes to Financial Statements

1. Summary of Significant Accounting Policies:

Organization:

Masonic Medical Research Laboratory, dba Masonic Medical Research Institute (the Institute), located in Utica, New York, is dedicated to improving the health and quality of life for all humankind. The Institute's primary mission is to conduct high-quality, basic biomedical research aimed at generating knowledge and information necessary for development of the medical cures and treatments of tomorrow. In 2020, the Institute began performing COVID-19 testing to support the needs of the local healthcare system and to obtain positive COVID-19 samples used for research to determine the long-term effects of the virus on the health and other organs. The testing is expected to continue through 2021.

Subsequent Events:

The Institute has evaluated events and transactions for potential recognition or disclosure through April 14, 2021, the date the financial statements were available to be issued.

Cash:

Cash in financial institutions may exceed insured limits at various times during the year and subject the Institute to concentrations of credit risk.

Investments:

Investments represent marketable securities stated at fair value on a recurring basis as determined by quoted prices in active markets. Investment securities are exposed to interest rate, market, and credit risks. Due to the level of risk associated with certain investment securities and the level of uncertainty related to changes in the value of investment securities, it is at least reasonably possible that changes in values in the near term could materially affect the amounts reported in the accompanying financial statements.

Property and Equipment:

Property and equipment is stated at cost or fair market value at the date of donation, net of accumulated depreciation. Depreciation is computed by the straight-line method over estimated service lives.

Net Assets:

The Institute reports information regarding its financial position and activities according to two classes of net assets: net assets without donor restrictions and net assets with donor restrictions.

Net assets with donor restrictions include those whose use has been limited by donors to a specific time period, purpose, or those to be maintained in perpetuity by the Institute.

Contributions:

Contributions, including unconditioned promises to give, are reported at fair value at the date the contribution is made. Contributions are recorded as restricted if they are received with donor stipulations that limit their use. When a donor restriction expires, net assets with donor restrictions are reclassified as net assets without donor restrictions and reported in the statement of activities as net assets released from restrictions. Donor restricted contributions whose restrictions are met within the same year as received are reported as contributions without donor restrictions in the accompanying statements of activities.

Unconditional promises to give that are expected to be collected within one year are recorded as contributions receivable at their net realizable value. Unconditional promises to give that are expected to be collected in future years are recorded at the present value of estimated future cash flows. The discounts on those amounts are computed using an appropriate interest rate applicable to the year in which the promise is received. Amortization of the discount is included in contribution revenue.

The Institute receives grants from governments, pharmaceutical companies, and other nonprofit organizations. These conditional contributions are recognized as revenue when allowable expenditures are incurred. The grant awards and reimbursements are subject to various compliance and financial audits by the funding source. Management believes no significant adjustments to recognized amounts are necessary.

Laboratory Service Fees and Related Receivables:

Laboratory service fees are recognized when COVID-19 tests are performed based on contract prices and terms established with a local healthcare system. Payment from the healthcare system is generally due within 90 days of billing.

Laboratory service fees receivable are stated at the amount management expects to collect from outstanding balances. No allowance for doubtful collections was deemed necessary at December 31, 2020.

Functional Expense Allocation:

The Institute's costs of providing its various programs and activities have been summarized on a functional basis in the statements of functional expenses. Accordingly, certain costs have been allocated among the programs and supporting services benefited. Those costs include depreciation, which is allocated on an estimated square footage basis, and certain other expenses allocated based on employee time and effort.

Tax Status:

The Institute is a 501(c)(3) corporation generally exempt from income taxes under Section 501(a) of the Internal Revenue Code.

Use of Estimates:

The preparation of financial statements in conformity with accounting principles generally accepted in the United States of America requires management to make estimates and assumptions that affect the amounts reported in the financial statements and accompanying notes. Actual results could differ from those estimates.

Reclassifications:

The 2019 financial statements have been reclassified to conform with the presentation adopted for 2020.

2. Receivables:

	2020	2019
Contributions:		
Grants	$ 505,774	$ 1,347,244
Others	921,545	2,546,208
Laboratory service fees	1,622,772	-
Other receivables	124	-
Accrued interest	20,844	26,458
	$ 3,071,059	$ 3,919,910

3. Investments:

	2020	2019
Cash and cash equivalents	$ 2,009,668	$ 2,247,160
Mutual funds	3,846,603	5,177,270
Equity securities	21,983,683	24,356,080
U.S. government securities	1,059,929	996,676
	$ 28,899,883	$ 32,777,186

The following summarizes investment return and its classification in the statements of activities:

	2020	
	Without Donor Restrictions	With Donor Restrictions
Dividends and interest, net of custodial fees of $62,703	$ 545,773	$ 175,749
Net realized losses	(36,651)	(48,765)
Net unrealized gains	135,911	174,156
	$ 645,033	$ 301,140

	2019	
	Without Donor Restrictions	With Donor Restrictions
Dividends and interest, net of custodial fees of $68,814	$ 824,380	$ 202,477
Net realized losses	(273,559)	(40,438)
Net unrealized gains	3,636,056	891,804
	$ 4,186,877	$ 1,053,843

4. Charitable Gift Annuities:

The Institute administers a charitable gift annuity plan whereby donors may contribute assets in exchange for the right to receive a fixed dollar annual return during their lifetimes. A portion of contributed assets is considered to be a charitable contribution for income tax purposes for the donor. The difference between the amount provided for the gift annuity and the liability for future payments, determined on an actuarial basis, is recognized as a contribution with donor restrictions at the date of the gift. Upon the death of the annuitant (or last joint annuitant), income distributions cease. State mandated reserves related to charitable gift annuity agreements are maintained at the required level.

The assets and liabilities of the planned giving program as of December 31, 2020 are $368,399 and $149,518. The assets and liabilities of the planned giving program as of December 31, 2019 were $356,128 and $157,457.

5. Property and Equipment:

	2020	2019
Buildings and improvements	$ 16,623,778	$ 12,766,760
Equipment	9,968,070	9,103,576
Furniture and fixtures	437,257	437,257
Vehicles	75,076	75,076
Construction in progress (Note 6)	78,500	728,080
	27,182,681	23,110,749
Less accumulated depreciation	10,188,338	8,779,046
	$ 16,994,343	$ 14,331,703

Interest totaling $41,488 and $20,696 was capitalized during the years ended December 31, 2020 and 2019. Construction in progress at December 31, 2020 relates to preliminary costs for a planned renovation project with an estimated cost of $3,345,000 to be approximately 20% funded with governmental grants.

6. Long-Term Debt:

The Institute has available a $12,000,000 bank credit facility to finance renovations of its building completed in 2020. The note carries interest at 2% above the one-month LIBOR rate and is secured by specific Institute investments valued at $18,003,000 at December 31, 2020 ($17,734,000 at December 31, 2019). Monthly interest-only payments are required until October 2021, at which time the principal balance is due. Amounts outstanding at December 31, 2020 and 2019 totaled $11,943,158 and $11,239,986.

7. Paycheck Protection Program Loan:

In April 2020, the Institute received a loan totaling $637,290 from the Small Business Administration under the Paycheck Protection Program of the Coronavirus Aid, Relief and Economic Security (CARES) Act, in response to the pandemic described in Note 14. In December 2020, all amounts on this loan were forgiven and a gain on the extinguishment of debt was recognized.

In March 2021, the Institute received a second loan totaling $703,322 from the SBA under the Paycheck Protection Program of the CARES Act. Some or all of the loan may be forgiven if certain criteria is met, otherwise the loan is unsecured, bears interest at 1%, and is payable over a negotiable period of time.

8. Net Assets with Donor Restrictions:

Net assets with donor restrictions are for the following purposes or periods:

	2020	2019
Subject to expenditure for research	$ 3,093,186	$ 2,960,299
Subject to the passage of time	308,881	373,671
Subject to the Institute's spending policy and appropriation:		
Investment in perpetuity (including amounts above the original gift value of $2,981,574), which, once appropriated, is expendable to support research (see Note 9)	4,464,050	4,475,656
Total net assets with donor restrictions	$ 7,866,117	$ 7,809,626

9. Endowment Assets:

The Institute's restricted endowment assets arise from donor-restricted endowments invested in perpetuity. The Institute has adopted investment and spending policies for endowment assets that attempt to provide returns sufficient to address the purposes of the assets over the long-term. The Institute seeks to distribute up to 5% of total endowment market value annually, while maintaining the purchasing power of the endowment assets over the long-term.

The Institute has interpreted the New York State Prudent Management of Institutional Funds Act (NYPMIFA) as requiring the preservation of the fair value of the original donor restricted endowment gift as of the gift date, absent explicit donor stipulations to the contrary. As a result of this interpretation, the Institute classifies as perpetual endowment (a) the original value of gifts donated to the perpetual endowment, (b) the original value of subsequent gifts to the perpetual endowment, and (c) accumulations to the perpetual endowment made in accordance with the direction of a donor gift instrument at the time the accumulation is added to the fund.

Investment earnings of perpetual endowment funds are monitored and appropriated for expenditure by the Institute in a manner consistent with the standard of prudence prescribed by NYPMIFA. In accordance with NYPMIFA, the Institute considers the following factors to appropriate or accumulate donor-restricted endowment funds:

- Duration and preservation of the fund
- Purposes of the Institute and the fund
- General economic conditions
- Possible effects of inflation and deflation
- Expected total return from income and appreciation of investments

- Other Institute resources
- Where appropriate and circumstances would otherwise warrant, alternatives to expenditure of the endowment fund, giving due consideration to the effect that such alternatives may have on the Institute
- Investment policy of the Institute

Investment gains (losses) related to the donor-restricted endowment are reported as increases (decreases) to net assets with donor restrictions until appropriated and expended in accordance with the Institute's spending policy. The Institute's restricted endowment assets activity for the years ended December 31, 2020 and 2019 is as follows:

	2020	2019
Endowment assets – beginning balance	$ 4,475,656	$ 3,742,298
Investment gains, net of custodian fees	172,620	915,928
Appropriations	(184,226)	(182,570)
Endowment assets – ending balance	$ 4,464,050	$ 4,475,656

10. Retirement Plan:

The Institute sponsors a defined-contribution retirement plan covering substantially all full-time employees. Beginning January 1, 2020, the plan allows for employer matching contributions of up to 10% of salaries. Through December 31, 2019, employer contributions were based upon a percentage of the participant's salary. The Institute's contributions to the plan amounted to $233,946 in 2020 and $192,355 in 2019.

11. Related Party Transactions:

The Institute receives voluntary contributions of New York State Masons through Masonic Brotherhood Foundation, Inc. In addition, other Masonic organizations throughout New York State contribute directly to the Institute. During the years ended December 31, 2020 and 2019, the Institute received contributions of $88,042 and $106,357 for operations through Masonic Brotherhood Foundation, Inc.

In addition, at December 31, 2020 and 2019, Masonic Brotherhood Foundation, Inc. held in a custodial account $660,677 and $603,299 of bequests on behalf of the Institute. Pursuant to accounting guidance, the investments remain as part of the foundation's net assets with all investment income disbursed to the Institute for its operations. Accordingly, such bequests are not recorded in the Institute's financial statements. Disbursements of investment income made to the Institute for 2020 and 2019 were $17,545 and $16,708.

The Institute is party to an agreement with the Grand Lodge of Free and Accepted Masons of the State of New York (the Grand Lodge). The Grand Lodge provides services to promote the Institute's fundraising objectives for an annual fee of $1 per Grand Lodge member through December 31, 2022. Annual amounts of $34,100 were incurred for the years ended December 31, 2020 and 2019. Amounts totaling $29,720 and $21,230 are due to the Grand Lodge at December 31, 2020 and 2019 for fundraising services and other expenses and are included in accrued expenses on the accompanying balance sheets.

The Institute's facilities are located on land owned by Masonic Care Community (MCC). The Institute pays a $1 annual fee to the trustees of MCC for use of this land. Utilities related to the facilities are paid to MCC and amounts totaling $26,486 and $17,594 are included in accounts payable on the accompanying balance sheets at December 31, 2020 and 2019. Additionally, in 2020, the Institute leased a separate building from MCC and recognized expense totaling $3,000.

12. Cash Flows Information:

Net cash flows from operating activities reflect cash payments for noncapitalized interest totaling $276,620 and $434,722 for the years ended December 31, 2020 and 2019.

13. Financial Assets Available for Operations:

The Institute obtains financial assets generally through grants, contributions and fundraising efforts. The financial assets are acquired throughout the year to help meet the Institute's cash needs for general expenditures. The Institute's financial assets available within one year of the balance sheet date to meet cash needs for general expenditures consist of the following at December 31, 2020 and 2019:

	2020	2019
Cash	$ 1,401,317	$ 227,506
Receivables	3,071,059	3,919,910
Investments	28,899,883	32,777,186
Less: investments restricted to expenditure for research	(3,093,186)	(2,960,299)
Less: investments subject to the Institute's spending policy and appropriation	(4,464,050)	(4,475,656)
Less: investments held as collateral for bank debt	(18,003,328)	(17,733,746)
	$ 7,811,695	$ 11,754,901

14. Risks and Uncertainties:

The Institute is involved in legal proceedings which, in the opinion of management, will not have a material adverse impact upon the financial position of the Institute.

On January 31, 2020, the United States Secretary of Health and Human Services (HHS) declared a public health emergency related to the global spread of coronavirus COVID-19, and a pandemic was declared by the World Health Organization in February 2020. Efforts to fight the widespread disease included limiting or closing many businesses and resulted in a severe disruption of operations for organizations. Financial markets also experienced a significant decline in value. The extent of the impact of COVID-19 on the Institute's operational and financial resources will depend on further developments, including the duration and spread of the outbreak. While the research lab is classified as an "essential business" by the New York State Governor and can remain open during the crisis, the overall impact on suppliers, donors, grantors, and employees cannot be predicted at this time.

MASONIC MEDICAL RESEARCH INSTITUTE

Supplementary Information
Schedule of Expenditures of Federal Awards

For the year ended December 31, 2020

Federal Grantor/Pass-Through Grantor/Program Title	CFDA Number	Grantor Number	Expenditures
U.S. Department of Defense:			
Direct award:			
Military Medical Research and Development	12.420	1810536	$ 8,401
U.S. Department of Veteran Affairs:			
Direct award:			
Intergovernmental Personnel Act	64.XXX	n/a	9,779
U.S. Department of Health and Human Services:			
Direct awards:			
Cardiovascular Diseases Research	93.837	102368	719,393 [1]
Cardiovascular Diseases Research	93.837	122238	518,171
Cardiovascular Diseases Research	93.837	140187	95,717
Cardiovascular Diseases Research	93.837	147044	274,326
			1,607,607
Passed through The Brigham and Women's Hospital, Inc.:			
Cardiovascular Diseases Research	93.837	148207	10,542
Cardiovascular Diseases Research	93.837	148355	11,271
			21,813
Passed through Massachusetts General Hospital:			
Cardiovascular Diseases Research	93.837	133153	220,776
Passed through Norfolk State University:			
Cardiovascular Diseases Research	93.837	145530	39,841
Passed through The Brigham and Women's Hospital, Inc.:			
Cancer Biology Research	93.396	190838	20,096
Passed through Regents of the University of Michigan:			
Blood Diseases and Resources Research	93.839	144550	42,541
Total Expenditures of Federal Awards			$ 1,970,854

[1] *Includes subrecipient award of $124,913*

Notes to Schedule of Expenditures of Federal Awards

1. Summary of Significant Accounting Policies:

Basis of Presentation:

The accompanying schedule of expenditures of federal awards (SEFA) presents the activity of all federal award programs administered by Masonic Medical Research Laboratory, dba Masonic Medical Research Institute (the Institute), an entity defined in Note 1 to the Institute's basic financial statements. Federal awards received directly from federal agencies, as well as federal awards passed through from other governmental agencies, are included on the SEFA.

Expenditures are calculated as required by the Uniform Guidance or the applicable program and do not constitute actual program disbursements.

Basis of Accounting:

The Institute uses the accrual basis of accounting for each federal program, consistent with the financial statements.

The amounts reported as federal expenditures generally were obtained from the appropriate federal financial reports for the applicable programs and periods. The amounts reported in these federal financial reports are prepared from records maintained for each program, which are periodically reconciled with the Institute's financial reporting system.

Indirect Costs:

The Institute has elected not to use the 10% de minimis indirect cost rate as allowed under the Uniform Guidance. Rather, the Institute applies an indirect cost rate as permitted by the grant agreements.

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INDEPENDENT AUDITORS' REPORT ON INTERNAL CONTROL OVER FINANCIAL REPORTING AND ON COMPLIANCE AND OTHER MATTERS BASED ON AN AUDIT OF FINANCIAL STATEMENTS PERFORMED IN ACCORDANCE WITH *GOVERNMENT AUDITING STANDARDS*

The Board of Directors
Masonic Medical Research Laboratory,
dba Masonic Medical Research Institute

We have audited, in accordance with the auditing standards generally accepted in the United States of America and the standards applicable to financial audits contained in *Government Auditing Standards* issued by the Comptroller General of the United States, the balance sheet of Masonic Medical Research Laboratory, dba Masonic Medical Research Institute (the Institute) as of December 31, 2020, and the related statements of activities, functional expenses, and cash flows, for the year then ended, and the related notes to the financial statements, which collectively comprise the Institute's basic financial statements, and have issued our report thereon dated April 14, 2021.

Internal Control over Financial Reporting

In planning and performing our audit of the financial statements, we considered the Institute's internal control over financial reporting (internal control) to determine the audit procedures that are appropriate in the circumstances for the purpose of expressing our opinion on the financial statements, but not for the purpose of expressing an opinion on the effectiveness of the Institute's internal control. Accordingly, we do not express an opinion on the effectiveness of the Institute's internal control.

A deficiency in internal control exists when the design or operation of a control does not allow management or employees, in the normal course of performing their assigned functions, to prevent, or detect and correct, misstatements on a timely basis. A material weakness is a deficiency, or a combination of deficiencies, in internal control such that there is a reasonable possibility that a material misstatement of the entity's financial statements will not be prevented, or detected and corrected on a timely basis. A significant deficiency is a deficiency, or a combination of deficiencies, in internal control that is less severe than a material weakness, yet important enough to merit attention by those charged with governance.

Our consideration of internal control was for the limited purpose described in the first paragraph of this section and was not designed to identify all deficiencies in internal control that might be material weaknesses or significant deficiencies. Given these limitations, during our audit we did not identify any deficiencies in internal control that we consider to be material weaknesses. However, material weaknesses may exist that have not been identified.

Compliance and Other Matters

As part of obtaining reasonable assurance about whether the Institute's financial statements are free from material misstatement, we performed tests of its compliance with certain provisions of laws, regulations, contracts, and grant agreements, noncompliance with which could have a direct and material effect on the determination of financial statement amounts. However, providing an opinion on compliance with those provisions was not an objective of our audit, and accordingly, we do not express such an opinion. The results of our tests disclosed no instances of noncompliance or other matters that are required to be reported under *Government Auditing Standards*.

Purpose of this Report

The purpose of this report is solely to describe the scope of our testing of internal control and compliance and the results of that testing, and not to provide an opinion on the effectiveness of the Institute's internal control or on compliance. This report is an integral part of an audit performed in accordance with *Government Auditing Standards* in considering the Institute's internal control and compliance. Accordingly, this communication is not suitable for any other purpose.

Lumsden & McCormick, LLP

April 14, 2021

Lumsden McCormick LLP
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INDEPENDENT AUDITORS' REPORT ON COMPLIANCE FOR EACH MAJOR FEDERAL PROGRAM AND ON INTERNAL CONTROL OVER COMPLIANCE REQUIRED BY THE UNIFORM GUIDANCE

The Board of Directors
Masonic Medical Research Laboratory,
dba Masonic Medical Research Institute

Report on Compliance for Each Major Federal Program

We have audited Masonic Medical Research Laboratory, dba Masonic Medical Research Institute's (the Institute) compliance with the types of compliance requirements described in the *OMB Compliance Supplement* that could have a direct and material effect on each of the Institute's major federal programs for the year ended December 31, 2020. The Institute's major federal programs are identified in the summary of auditors' results section of the accompanying schedule of findings and questioned costs.

Management's Responsibility

Management is responsible for compliance with federal statutes, regulations, and the terms and conditions of its federal awards applicable to its federal programs.

Auditors' Responsibility

Our responsibility is to express an opinion on compliance for each of the Institute's major federal programs based on our audit of the types of compliance requirements referred to above. We conducted our audit of compliance in accordance with auditing standards generally accepted in the United States of America; the standards applicable to financial audits contained in *Government Auditing Standards*, issued by the Comptroller General of the United States; and the audit requirements of Title 2 U.S. *Code of Federal Regulations* Part 200, *Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards* (Uniform Guidance). Those standards and the Uniform Guidance require that we plan and perform the audit to obtain reasonable assurance about whether noncompliance with the types of compliance requirements referred to above that could have a direct and material effect on a major federal program occurred. An audit includes examining, on a test basis, evidence about the Institute's compliance with those requirements and performing such other procedures as we considered necessary in the circumstances.

We believe that our audit provides a reasonable basis for our opinion on compliance for each major federal program. However, our audit does not provide a legal determination of the Institute's compliance.

Opinion on Each Major Federal Program

In our opinion, the Institute complied, in all material respects, with the compliance requirements referred to above that could have a direct and material effect on each of its major federal programs for the year ended December 31, 2020.

Report on Internal Control over Compliance

Management of the Institute is responsible for establishing and maintaining effective internal control over compliance with the types of compliance requirements referred to above. In planning and performing our audit of compliance, we considered the Institute's internal control over compliance with the types of requirements that could have a direct and material effect on each major federal program to determine the auditing procedures that are appropriate in the circumstances for the purpose of expressing an opinion on compliance for each major federal program and to test and report on internal control over compliance in accordance with the Uniform Guidance, but not for the purpose of expressing an opinion on the effectiveness of internal control over compliance. Accordingly, we do not express an opinion on the effectiveness of the Institute's internal control over compliance.

A deficiency in internal control over compliance exists when the design or operation of a control over compliance does not allow management or employees, in the normal course of performing their assigned functions, to prevent, or detect and correct, noncompliance with a type of compliance requirement of a federal program on a timely basis. A material weakness in internal control over compliance is a deficiency, or combination of deficiencies, in internal control over compliance, such that there is a reasonable possibility that material noncompliance with a type of compliance requirement of a federal program will not be prevented, or detected and corrected, on a timely basis. A significant deficiency in internal control over compliance is a deficiency, or a combination of deficiencies, in internal control over compliance with a type of compliance requirement of a federal program that is less severe than a material weakness in internal control over compliance, yet important enough to merit attention by those charged with governance.

Our consideration of internal control over compliance was for the limited purpose described in the first paragraph of this section and was not designed to identify all deficiencies in internal control over compliance that might be material weaknesses or significant deficiencies. We did not identify any deficiencies in internal control over compliance that we consider to be material weaknesses. However, material weaknesses may exist that have not been identified.

The purpose of this report on internal control over compliance is solely to describe the scope of our testing of internal control over compliance and the results of that testing based on the requirements of the Uniform Guidance. Accordingly, this report is not suitable for any other purpose.

Lumsden & McCormick, LLP

April 14, 2021

MASONIC MEDICAL RESEARCH INSTITUTE

Schedule of Findings and Questioned Costs

For the year ended December 31, 2020

Section I. Summary of Auditors' Results

Financial Statements

Type of auditors' report issued:	*Unmodified*
Internal control over financial reporting:	
• Material weakness(es) identified?	No
• Significant deficiency(ies) identified?	None reported
Noncompliance material to financial statements noted?	No

Federal Awards

Internal control over major programs:	
• Material weakness(es) identified?	No
• Significant deficiency(ies) identified?	None reported
Type of auditors' report issued on compliance for major programs:	*Unmodified*
Any audit findings disclosed that are required to be reported in accordance with 2 CFR 200.516(a)?	No

Identification of major programs:

Name of Federal Program or Cluster	CFDA #	Amount
Cardiovascular Diseases Research	93.837	$ 1,890,037

Dollar threshold used to distinguish between type A and type B programs:	$750,000
Auditee qualified as low-risk auditee?	Yes

Section II. Financial Statement Findings

No findings were reported.

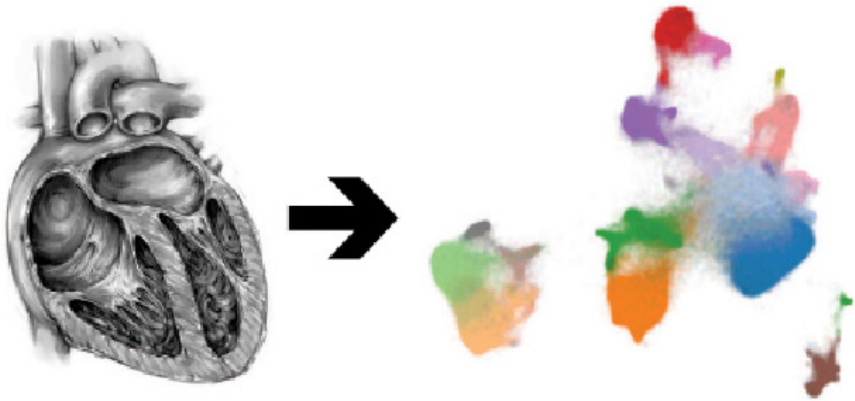
Section III. Federal Award Findings and Questioned Costs

No findings were reported.

MASONIC MEDICAL RESEARCH INSTITUTE
2020 YEAR IN REVIEW

2020 MMRI PUBLICATIONS

Publications are an essential component of medical research, providing the means by which the scientific community communicates their work. Through their documentation of experimental results, researchers can learn from one another and aid in collaborative efforts that can further advance therapeutics and/or scientific discovery. Teachers can also utilize the published manuscripts to educate the next generation of aspiring scientists. Additionally, publishing in peer-reviewed journals allows for local, national, and global recognition of an individual, team, university, or institution. In 2020, even amidst the pandemic, our researchers collectively published 32 manuscripts in top-tier scientific journals, covering topics such as arrhythmias, atrial fibrillation, metabolism, nanotherapies, brown adipose tissue, heart failure, and COVID-19.



Dr. Nathan Tucker, Assistant Professor, along with researchers from the Precision Cardiology Lab (PCL) of the Broad Institute at MIT and Harvard, Bayer USA, Massachusetts General Hospital, and University of Pennsylvania collaborated to uncover some pressing questions about the biology of the heart. Together, they used a state-of-the-art technique termed single nucleus RNA sequencing to uncover the previously unknown complexity of the human heart. This research was published in the scientific journal Circulation.

2020 MMRI PUBLICATIONS

aYAP modRNA Reduces Cardiac Inflammation and Hypertrophy in a Murine Ischemia-Reperfusion. Chen J, Ma Q, King JS, Sun Y, Xu B, Zhang X, Zohrabian S, Guo H, Cai W, Li G, Bruno I, Cooke JP, Wang C, **Kontaridis M**, Wang DZ, Luo H, Pu WT, **Lin Z**.Life Sci Alliance. 2019 Dec 16;3(1):e201900424. doi: 10.26508/lsa. 201900424. Print 2020 Jan. PMID: 31843959

Remodeling Promotes Proarrhythmic Disruption of Calcium Homeostasis in Failing Atrial Myocytes. Shiferaw Y, **Aistrup GL**, Louch WE, Wasserstrom JA. Biophys J. 2020 Jan 21;118(2):476-491 doi: 10.1016/j.bpj.2019.12.012. Epub 2019 Dec 18.PMID: 31889516

The Sixth International RASopathies Symposium: Precision Medicine-From Promise To Practice. Gripp KW, Schill L, Schoyer L, Stronach B, Bennett AM, Blaser S, Brown A, Burdine R, Burkitt-Wright E, Castel P, Darilek S, Dias A, Dyer T, Ellis M, Erickson G, Gelb BD, Green T, Gross A, Ho A, Holder JL Jr, Inoue SI, Jelin AC, Kennedy A, Klein R, **Kontaridis MI**, Magoulas P, McConnell DB, McCormick F, Neel BG, Prada CE, Rauen KA, Roberts A, Rodriguez-Viciana P, Rosen N, Rumbaugh G, Sablina A, Solman M, Tartaglia M, Thomas A, Timmer WC, Venkatachalam K, Walsh KS, Wolters PL, Yi JS, Zenker M, Ratner N. Am J Med Genet A. 2020 Mar;182(3):597-606. doi: 10.1002/ ajmg.a.61434. Epub 2019 Dec11 PMID: 31825160

Loss of UGP2 in Brain Leads to a Severe Epileptic Encephalopathy, Emphasizing that Bi-Allelic Isoform-Specific Start-Loss Mutations of Essential Genes Can Cause Genetic Diseases. Perenthaler E, Nikoncuk A, Yousefi S, Berdowski WM, Alsagob M, Capo I, van der Linde HC, van den Berg P, Jacobs EH, Putar D, Ghazvini M, Aronica E, van IJcken WFJ, de Valk WG, Medici-van den Herik E, van Slegtenhorst M, Brick L, Kozenko M, Kohler JN, Bernstein JA, Monaghan KG, Begtrup A, Torene R, Al Futaisi A, Al Murshedi F, Mani R, Al Azri F, Kamsteeg EJ, Mojarrad M, Eslahi A, Khazaei Z, Darmiyan FM, Doosti M, Karimiani EG, Vandrovcova J, Zafar F, Rana N, Kandaswamy KK, Hertecant J, Bauer P, AlMuhaizea MA, Salih MA, Aldosary M, Almass R, Al-Quait L, Qubbaj W, Coskun S, Alahmadi KO, Hamad MHA, Alwadaee S, Awartani K, Dababo AM, Almohanna F, Colak D, Dehghani M, Mehrjardi MYV, Gunel M, **Ercan-Sencicek AG**, Passi GR, Cheema HA, Efthymiou S, Houlden H, Bertoli-Avella AM, Brooks AS, Retterer K, Maroofian R, Kaya N, van Ham TJ, Barakat TS.Acta Neuropathol. 2020 Mar;139(3):415-442. doi: 10.1007/s00401-019-02109-6 Epub 2019 Dec 9. PMID: 31820119

AAV Gene Therapy Prevents and Reverses Heart Failure in a Murine Knockout Model of Barth Syndrome. Wang S, Li Y, Xu Y, Ma Q, **Lin Z**, Schlame M, Bezzerides VJ,Strathdee D, Pu WT. Circ Res. 2020 Apr 10;126(8):1024-1039. doi:10.1161/CIRCRESAHA. 119.315956. Epub 2020 Mar 9. PMID: 32146862

Hand Sanitizers: A Review on Formulation Aspects, Adverse Effects, and Regulations. Jing JLJ, Pei Yi T, **Bose RJC**, **McCarthy JR**, Tharmalingam N,Madheswaran T. Int J Environ Res Public Health. 2020 May 11;17(9):3326.doi:10.3390/ijerph17093326. PMID: 32403261

Protein Arginine Methyltransferase 6 Mediates Cardiac Hypertrophy by Differential Regulation of Histone H3 Arginine Methylation. Raveendran VV, Al-Haffar K, Kunhi M, Belhaj K, Al-Habeeb W, Al-Buraiki J, Eyjolsson A, **Poizat C**. Heliyon. 2020 May 12;6(5):e03864. doi: 10.1016/j.heliyon.2020.e03864. eCollection 2020 May. PMID: 32420474

2020 MMRI PUBLICATIONS (continued)

Transcriptional and Cellular Diversity of the Human Heart. **Tucker NR**, Chaffin M, Fleming SJ, Hall AW, Parsons VA, Bedi KC Jr, Akkad AD, Herndon CN, Arduini A, Papangeli I, Roselli C, Aguet F, Choi SH, Ardlie KG, Babadi M, Margulies KB, Stegmann CM, Ellinor PT. Circulation. 2020 May 14. doi: 10.1161/CIRCULATION AHA.119.045401.PMID: 32403949

The SK Channel Inhibitors NS8593 and UCF1684 Prevent the Development of Atrial Fibrillation Via Atrial-Selective Inhibition of Sodium Channel Activity. **Burashnikov A**, **Barajas-Martinez H**, **Hu D**, Robinson VM, Grunnet M, **Antzelevitch C**. J Cardiovasc Pharmacol. 2020 May 20. doi: 10.1097/FJC.0000000000000855. PMID: 32453071

Transethnic Genome-Wide Association Study Provides Insights in the Genetic Architecture and Heritability of Long QT Syndrome. Lahrouchi N, Tadros R, Crotti L,Mizusawa Y, Postema PG, Beekman L, Walsh R, Hasegawa K, Barc J, Ernsting M,Turkowski KL, Mazzanti A, Beckmann BM, Shimamoto K, Diamant UB, Wijeyeratne YD, Kucho Y, Robyns T, Ishikawa T, Arbelo E, Christiansen M, Winbo A, Jabbari R, Lubitz SA, Steinfurt J, Rudic B, Loeys B, Shoemaker MB, Weeke PE, **Pfeiffer R**, Davies B, Andorin A, Hofman N, Dagradi F, Pedrazzini M, Tester DJ, Bos JM, Sarquella-Brugada G, Campuzano Ó, Platonov PG, Stallmeyer B,Zumhagen S, Nannenberg EA, Veldink JH, van den Berg LH, Al-Chalabi A, Shaw CE,Shaw PJ, Morrison KE, Andersen PM, Müller-Nurasyid M, Cusi D, Barlassina C,Galan P, Lathrop M, Munter M, Werge T, Ribasés M, Aung T, Khor CC, Ozaki M, Lichtner P, Meitinger T, van Tintelen JP, Hoedemaekers Y, Denjoy I, Leenhardt A,Napolitano C, Shimizu W, Schott JJ, Gourraud JB, Makiyama T, Ohno S, Itoh H, Krahn AD, Antzelevitch C, Roden DM, Saenen J, Borggrefe M, Odening KE, Ellinor PT, Tfelt-Hansen J, Skinner JR, van den Berg MP, Olesen MS, Brugada J, Brugada R, Makita N, Breckpot J, Yoshinaga M, Behr ER, Rydberg A, Aiba T, Kääb S, Priori SG,Guicheney P, Tan HL, Newton-Cheh C, Ackerman MJ, Schwartz PJ,Schulze-Bahr E, Probst V, Horie M, Wilde AA, Tanck MWT, Bezzina CR.Circulation. 2020 May 20. doi:10.1161 /CIRCULATIONAHA.120.045956. PMID: 32429735

Multi-ancestry GWAS of the electrocardiographic PR interval identifies 202 loci underlying cardiac conduction. Ntalla I, Weng LC, Cartwright JH, Hall AW, Sveinbjornsson G, **Tucker NR**, Choi SH, Chaffin MD, Roselli C, Barnes MR, Mifsud B, Warren HR, Hayward C, Marten J, Cranley JJ, Concas MP, Gasparini P, Boutin T, Kolcic I, Polasek O, Rudan I, Araujo NM, Lima-Costa MF, Ribeiro ALP, Souza RP, Tarazona-Santos E, Giedraitis V, Ingelsson E, Mahajan A, Morris AP, Del Greco M F, Foco L, Gögele M, Hicks AA, Cook JP, Lind L, Lindgren CM, Sundström J, Nelson CP, Riaz MB, Samani NJ, Sinagra G, Ulivi S, Kähönen M, Mishra PP, Mononen N, Nikus K, Caulfield MJ, Dominiczak A, Padmanabhan S, Montasser ME, O'Connell JR, Ryan K, Shuldiner AR, Aeschbacher S, Conen D, Risch L, Thériault S, Hutri-Kähönen N, Lehtimäki T, Lyytikäinen LP, Raitakari OT, Barnes CLK, Campbell H, Joshi PK, Wilson JF, Isaacs A, Kors JA, van Duijn CM, Huang PL, Gudnason V, Harris TB, Launer LJ, Smith AV, Bottinger EP, Loos RJF, Nadkarni GN, Preuss MH, Correa A, Mei H, Wilson J, Meitinger T, Müller-Nurasyid M, Peters A, Waldenberger M, Mangino M, Spector TD, Rienstra M, van de Vegte YJ, van der Harst P, Verweij N, Kääb S, Schramm K, Sinner MF, Strauch K, Cutler MJ, Fatkin D, London B, Olesen M, Roden DM, Benjamin Shoemaker M, Gustav Smith J, Biggs ML, Bis JC, Brody JA, Psaty BM, Rice K, Sotoodehnia N, De Grandi A, Fuchsberger C, Pattaro C, Pramstaller PP, Ford I, Wouter Jukema J, Macfarlane PW, Trompet S, Dörr M, Felix SB, Völker U, Weiss S, Havulinna AS, Jula A, Sääksjärvi K, Salomaa V, Guo X, Heckbert SR, Lin HJ, Rotter JI, Taylor KD, Yao J, de Mutsert R, Maan AC, Mook-Kanamori DO, Noordam R, Cucca F, Ding J, Lakatta EG, Qian Y, Tarasov KV, Levy D, Lin H, Newton-Cheh CH, Lunetta KL, Murray AD, Porteous DJ, Smith BH, Stricker BH, Uitterlinden A, van den Berg ME, Haessler J, Jackson RD, Kooperberg C, Peters U, Reiner AP, Whitsel EA, Alonso A, Arking DE, Boerwinkle E, Ehret GB, Soliman EZ, Avery CL, Gogarten SM, Kerr KF, Laurie CC, Seyerle AA, Stilp A, Assa S, Abdullah Said M, Yldau van der Ende M, Lambiase PD, Orini M, Ramirez J, Van Duijvenboden S, Arnar DO,

2020 MMRI PUBLICATIONS (continued)

Gudbjartsson DF, Holm H, Sulem P, Thorleifsson G, Thorolfsdottir RB, Thorsteinsdottir U, Benjamin EJ, Tinker A, Stefansson K, Ellinor PT, Jamshidi Y, Lubitz SA, Munroe PB.Nat Commun. 2020 May 21;11(1):2542. doi: 10.1038/s41467-020-15706-x PMID: 32439900

Reconstructed Apoptotic Bodies as Targeted "Nano Decoys" to Treat Intracellular Bacterial Infections Within Macrophages and Cancer Cells. **Bose RJC**, Tharmalingam N, Garcia Marques FJ, Sukumar UK, Natarajan A, Zeng Y, Robinson E, Bermudez A, Chang E, Habte F, Pitteri SJ, **McCarthy JR**, Gambhir SS, Massoud TF, Mylonakis E,Paulmurugan R.ACS Nano. 2020 May 26; 14(5):5818-5835. doi: 10.1021/acsnano.0c00921Epub 2020 May 4. PMID: 32347709

Abnormal Myocardial Expression of SAP97 is Associated with Arrhythmogenic Risk. Musa H, Marcou CA, Herron TJ, Makara MA, Tester DJ, O'Connell RP, Rosinski B, Guerrero-Serna G, Milstein ML, Monteiro da Rocha A, Ye D, Crotti L, **Nesterenko VV**, Castelletti S, Torchio M, Kotta MC, Dagradi F, **Antzelevitch C**, Mohler PJ, Schwartz PJ, Ackerman MJ, Anumonwo JM.Am J Physiol Heart Circ Physiol. 2020 Jun 1;318(6):H1357-H1370 doi: 10.1152/ajpheart.00481.2019. Epub 2020 Mar 20. PMID: 32196358

Triggered Ca2+ Waves Induce Depolarization of Maximum Diastolic Potential And Action Potential Prolongation in Dog Atrial Myocytes. Gussak G, Marszalec W, Yoo S, Modi R, O'Callaghan C, **Aistrup GL**, **Cordeiro JM**, **Goodrow R**, Kanaporis G,Blatter LA, Shiferaw Y, Arora R, Zhou J, Burrell AR, Wasserstrom JA.Circ Arrhythm Electrophysiol. 2020 Jun;13(6):e008179. doi: 10.1161/CIRCEP.119.008179. Epub 2020 May 20 PMID: 32433891

Epigenetic and Transcriptional Networks Underlying Atrial Fibrillation. van Ouwerkerk AF, Hall AW, Kadow ZA, Lazarevic S, Reyat JS, **Tucker NR**, Nadadur RD, Bosada FM, Bianchi V, Ellinor PT, Fabritz L, Martin JF, de Laat W, Kirchhof P, Moskowitz IP, Christoffels VM. Circ Res. 2020 Jun 19;127(1):34-50. doi: 10.1161/CIRCRESAHA.120.316574 Epub 2020 Jun 18. PMID: 32717170

Direct SARS-Co V-2 Infection of the Heart Potentiates the Cardiovascular Sequelae Of COVID-19. **Bose RJC**, **McCarthy JR**. Drug Discov Today. 2020 Jun 24:S1359-6446(20)30249-X. doi: 10.1016/j.drudis.2020.06.021.PMID: 32592868

Genetic Algorithm For Fitting Cardiac Cell Biophysical Model Formulations. Akwaboah AD, Yamlome P, **Treat JA**, **Cordeiro JM**, Deo M.Annu Int Conf IEEE Eng Med Biol Soc. 2020 Jul;2020:2463-2466. doi: 10.1109/EMBC44109.2020.9175707.PMID: 33018505

Attenuation of Oxidative Injury with Targeted Expression of NOX2 shRNA Prevents Onset and Maintenance of Electrical Remodeling in the Canine Atrium: A Novel Gene Therapy Approach To Atrial Fibrillation. Yoo S, Pfenniger A, Hoffman J, Zhang W, Ng J, Burrell A, Johnson DA, Gussak G, Waugh T, Bull S, Benefield B, Knight BP, Passman R, Wasserstrom JA, **Aistrup GL**, Arora R. Circulation. 2020 Jul 20 doi: 10.1161/CIRCULATIONAHA.119.044127. PMID: 32686471

Myocyte-Specific Upregulation of ACE2 in Cardiovascular Disease: Implications for SARS-CoV-2-Mediated Myocarditis. **Tucker NR**, Chaffin M, Bedi KC Jr, Papangeli I, Akkad AD, Arduini A, Hayat S, Eraslan G, Muus C, Bhattacharyya RP, Stegmann CM; Human Cell Atlas Lung Biological Network, Margulies KB, Ellinor PT; Human Cell Atlas Lung Biological Network Consortium Members.Circulation. 2020 Aug 18;142(7):708-710. doi:10.1161/CIRCULATIONAHA.120.047911. Epub 2020 Jun 22.PMID: 32795091

2020 MMRI PUBLICATIONS (continued)

Cavin1 Deficiency Causes Disorder of Hepatic Glycogen Metabolism and Neonatal Death by Impacting Fenestrations in Liver Sinusoidal Endothelial Cells. Wei Z, Lei J, Shen F, Dai Y, **Sun Y**, Liu Y, Dai Y, Jian Z, Wang S, Chen Z, Liao K, Hong S. Adv Sci (Weinh). 2020 Aug 21;7(19):2000963. doi: 10.1002/advs.202000963 eCollection 2020 Oct. PMID: 33042738

Susceptibility to Ventricular Arrhythmias Resulting from Mutations in FKBP1B, PXDNL, and SCN9A Evaluated in hiPSC Cardiomyocytes. Barajas-Martinez H, **Smith M**, **Hu D**, **Goodrow RJ**, **Puleo C**, Hasdemir C, **Antzelevitch C**, **Pfeiffer R**, **Treat JA**, **Cordeiro JM**. Stem Cells Int. 2020 Sep 1; 2020:8842398 doi: 10.1155/2020/8842398. eCollection 2020.PMID: 32952569

Intercalated Disk Protein Xinβ is Required for Hippo-YAP Signaling in the Heart. Guo H, Lu YW, **Lin Z**, Huang ZP, Liu J, Wang Y, Seok HY, Hu X, Ma Q, Li K, Kyselovic J,Wang Q, Lin JL, Lin JJ, Cowan DB, Naya F, Chen Y, Pu WT, Wang DZ. Nat Commun. 2020 Sep 16;11(1):4666. doi: 10.1038/s41467-020-18379-8. PMID: 32938943

Combating Intracellular Pathogens with Nanohybrid-Facilitated Antibiotic Delivery. Bose RJC, Tharmalingam N, Choi Y, Madheswaran T, Paulmurugan R, **McCarthy JR**, Lee SH, Park H. Int J Nanomedicine. 2020 Oct 29;15:8437-8449. doi: 10.2147/IJN.S271850 eCollection 2020. PMID: 33162754

Labeling and Tracking Cells with Gold Nanoparticles. Chandrasekaran R, Madheswaran T, Tharmalingam N, **Bose RJC**, Park H, Ha DH. Drug Discov Today. 2020 Oct 31:S1359-6446(20)30437-2. doi: 10.1016/j.drudis.2020.10.020. PMID: 33130336

Cardiac Inflammation in COVID-19: Lessons from Heart Failure. Unudurthi SD, Luthra P, **Bose RJC**, **McCarthy JR**, **Kontaridis MI**. Life Sci. 2020 Nov 1 260:118482. doi: 10.1016/j.lfs.2020.118482. Epub 2020 Sep 21. PMID: 32971105

Role of the rapid delayed rectifier K+ current in human induced pluripotent stem cells derived cardiomyocytes. Deo M, Akwaboah A, Tsevi B, **Treat JA**, **Cordeiro JM**. Arch Stem Cell Ther. 2020;1(1):14-18. doi:10.46439/ stemcell.1.003. PMID: 33604593

Data-Driven Uncertainty Quantification for Cardiac Electrophysiological Models: Impact of Physiological Variability on Action Potential and Spiral Wave Dynamics. Pathmanathan P, Galappaththige SK, **Cordeiro JM**, Kaboudian A, Fenton FH, Gray RA. Front Physiol. 2020 Nov 19;11:585400. doi: 10.3389/fphys.2020.585400 eCollection 2020 PMID: 33329034

Both Proliferation and Lipogenesis of Brown Adipocytes Contribute to Postnatal Brown Adipose Tissue Growth in Mice. Negron SG, **Ercan-Sencicek AG**, **Freed J**, Walters M, **Lin Z**. Sci Rep. 2020 Nov 23 10(1):20335. doi: 10.1038/s41598-020-77362-x. PMID:33230135

Epigenetic Analyses of Human Left Atrial Tissue Identifies Gene Networks Underlying Atrial Fibrillation. Hall AW, Chaffin M, Roselli C, Lin H, Lubitz SA, Bianchi V, Geeven G, Bedi K, Margulies KB, de Laat W, **Tucker NR**, Ellinor PT. Circ Genom Precis Med. 2020 Dec;13(6):e003085 doi: 10.1161/CIRCGEN.120.003085. Epub 2020 Nov 6. PMID: 33155827

2020 MMRI PUBLICATIONS (continued)

Neurological Disorders and Risk of Arrhythmia. **Bernardi J**, **Aromolaran KA**, **Aromolaran AS**. Int J Mol Sci. 2020 Dec 27; 22(1):E188 doi: 10.3390/ijms22010188. PMID:33375447

Biomimetic Bacterial and Viral-Based Nanovesicles for Drug Delivery, Theranostics, and Vaccine Applications. Loo YS, **Bose RJC**, **McCarthy JR**, Mat Azmi ID, Madheswaran T. Drug Discov Today 2020 Dec 28:S1359 6446(20)30535-3. doi: 10.1016/j.drudis.2020.12.017. PMID: 33383213

A patient with mental retardation, enteropathy, deafness, peripheral neuropathy, ichthyosis, keratodermia syndrome caused by AP1B1 gene variant. Meriç R, **Ercan-Sencicek AG**, Uludağ Alkaya D, Şahin Y, Sar M, Bilguvar K, Tüysüz B.Clin Dysmorphol. 2021 Jan;30(1):54-57. doi:10.1097/MCD.0000000000000350.PMID: 32969855

Micro Computed Tomography image taken by Dr. Chase Kessinger, Instructor, for Dr. Coralie Poizat, Research Associate Professor. Image is of a normal mouse heart (left) and of a severely dilated mouse heart in end-stage heart failure (right).

FEDERAL AND FOUNDATION GRANT FUNDING

Grant funding is an important and integral component of medical research, as it provides our investigators with the vital financial resources to conduct cutting-edge science. Faculty at the MMRI submit numerous grant proposals to federal agencies and national foundations each year. These are all highly competitive applications that are peer reviewed by the nation's top scientific experts. As such, receipt of these awards validates the importance and significance of the science at MMRI. Grants are commonly multi-year awards, with annual budgeting allocations distributed to secure the continuation of the project for the duration of the funding period. Note that five of the following awards were newly garnered in 2020.

Masonic Medical Research Institute all staff image.

FEDERAL AND FOUNDATION GRANT FUNDING

Kontaridis, Ph.D., Maria I.

Pilot Grant (Kontaridis, PI) 06/01/19 - 12/31/20
Order of the Eastern Star $50,000
The Role of SHP2 in the development of Systemic Lupus Erythematosus
The major goal of this pilot project is to determine the functional role of SHP2 in SLE and provided the preliminary assessments for the proposed DOD project.

Pilot Grant (Kontaridis, PI) 06/01/19 - 12/31/20
Grand Lodge of Free and Accepted Masons of the State of NY $50,000
Identification of novel genetic causes of autism.
The major goal of this project is to identify novel genes associated with autism.
No overlap.

R01HLHL122238 (McCarthy, PI; Kontaridis, Co-Inv.) 04/1/15 - 12/31/20
NIH/NHLBI $162,841/year
Targeted Inhibition of fibrosis for the prevention of heart failure
The major goal is to determine the efficacy of nanoparticle-targeted Inhibition of fibrosis.
No overlap.

2R01HL102368-06A1 (Kontaridis, PI) 04/15/10 - 08/31/21
NIH/NHLBI $669,155/year
Role of RhoA in the Molecular Pathogenesis of Heart Disease
In this renewal, we will 1) examine RhoA-mediated paracrine signals that drive myofibroblast transformation and activation; 2) determine if RhoA signaling is necessary and sufficient for direct myofibroblast function both in vitro and in vivo using a novel inducible, fibroblast-specific transgenic approach; 3) utilize novel nanoparticle targeting technology to deliver cell specific inhibitors of RhoA effectors to ameliorate fibrosis and to prevent cardiac disease progression.
No overlap.

1 R01 CA190838-01A1 (Schatton, PI; Kontaridis, Co-Inv.) 09/13/17 - 07/31/22
NIH $21,260/year
Role of melanoma-PD-1 in cancer progression
The major goal is to determine the functional effects of PD-1 in cancer as a consequence of SHP2 activity and downstream signaling.
No overlap.

Onconova Therapeutics (PI, Kontaridis) 01/01/20 – 12/31/21
Treatment of cardiac hypertrophy using RAF1 inhibitors. $60,943/year
The major goal of this project is to characterize the role of RAF1 signaling in cardiomyocyte hypertrophy with an aim of identifying potential therapeutic targets.
No overlap.

FEDERAL AND FOUNDATION GRANT FUNDING (continued)

Aromolaran, Ph.D., Ademuyiwa

NIH-R01 Grant 2019 - 2023
NHLBI $437,500/year
Role: PI
Mechanisms of Lipotoxic Cardiomyopathy
The major goals of this grant proposal are to define the role of free-fatty acids in the pathogenesis of atrial fibrillation underlain by lipotoxicity.
No overlap.

Cordeiro, Ph.D., Jonathan

1R15HL145530 - 01A1 (PI: Deo) 08/01/19 - 7/31/22
"Role of Cardiac Purkinje System in Long QT Syndrome" $35,000/year
Role: Co-investigator
The long QT syndrome (LQTS) is a heritable or acquired cardiac disease characterized by prolongation of the QT interval on the ECG and increases the risk of developing spontaneous polymorphic ventricular tachycardia (VT) and sudden cardiac death in young patients. Our general hypothesis is that prolongation of inherently longer action potentials in the His-PS in response to loss of repolarizing current IKr together with modulation of electrical excitations within the PS network makes the ventricular conduction system a preferable arrhythmia-prone substrate in LQTS. A systematic study will be conducted to investigate the mechanisms by which PS contributes to arrhythmias (specifically LQT2) using experimental characterizations in transfected cardiomyocytes (CMs), combined with previously acquired ion channel data and multiscale computer modeling/ predictive simulations. My role is to perform the cardiomyocyte experiments which will then be incorporated into a multiscale computer model.

McCarthy, Ph.D., Jason

R01HL122238 (McCarthy) 04/01/2015-03/31/2021
NIH-NHBLI $355,329/year
Targeted inhibition of fibrosis for the prevention of heart failure
This proposal focuses on the synthesis, characterization, and applications of targeted nanoagents for the prevention of fibrosis after myocardial infarction via the inhibition of pro-fibrotic pathways downstream of the Rho kinase RhoA.

R01HL102368 (Kontaridis) 01/01/2018 – 08/31/2021
NIH-NHLBI $128,445/year
Role of RhoA in the Molecular Pathogenesis of Heart Disease
This project is designed to investigate the cellular interactions responsible for the promotion of fibrosis in the injured heart.

FEDERAL AND FOUNDATION GRANT FUNDING (continued)

OR170402 (Schoenecker) 07/01/2018 – 06/30/2021
DOD $17,101/year
Plasmin Therapy to Prevent Post-Traumatic Heterotopic Ossification in the Upper Extremity After Severe Injury
One of the greatest mysteries, and problems, is why these severely injured patients often develop bone in areas of muscle injuries. This is called heterotopic ossification and is a big problem in the military as it has inflected more the 60% of severe injuries during the Afghanistan and Iraqi conflicts. It is well known that that plasmin, a protein capable of breaking up other proteins, is very important in muscle and bone healing. We have recently discovered that it also is important in preventing heterotopic ossification, and that in cases of severe injury, it is used up. We therefore tested the idea that we could prevent heterotopic ossification from forming if we used drugs to restore this protein.

BX002327 (Menick) 04/01/2019 – 03/31/2023
VA $10,000/year
Regulatory Role of HDAC in Post-MI Ventricular Remodeling
This work will give us new molecular insights into the role of class I HDACs in regulating M1>M2 macrophage polarization and possibly open a novel site-directed therapeutic approach to improve post-MI remodeling, ventricular function, and survival.

R01HL144550 (Henke) 02/01/2020-01/31/2024
NIH-NHLBI $62,269/year
The Monocyte/Macrophage Role in Experimental Deep Vein Thrombosis Resolution and Vein Wall Injury
Monocyte/macrophages (Mo/MØ) are the primary leukocyte directing two key pathobiologic processes: venous thrombosis resolution and the associated vein wall fibrotic injury. Mo/MØ are classified by their inflammatory or anti-inflammatory functions, which is a dynamic process in vivo. In this proposal, we will: 1. Define the origin and phenotype of Mo/MØ in the thrombosed vein with sex, age, and thrombogenic model variation; 2. Directly determine the Mo/MØ mediated mechanisms of VT resolution and vein wall injury; and 3. Determine if systemic Mo/MØ polarization or local exogenous modulation of thrombus environment can promote VT resolution and vein wall healing.

R01HL148355 (Feinberg) 04/01/2020-03/31/2022
NIH-NHLBI $43,435/year
LncRNA SNHG12, vascular senescence, and atherosclerosis
LncRNA SNHG12 plays a critical role in key aspects of the vascular endothelial inflammation or senescence in the context of atherosclerosis. To help explore the pathobiology and mechanisms of this lncRNA in the setting of disease, we will generate nanomaterials targeted to these lesions for the site-specific delivery of a gapmeR to SNHG12.

R01HL148207 (Feinberg) 04/01/2020-03/31/2022
NIH-NHLBI $43,435/year
miR-615, AKT/eNOS signaling, and angiogenesis
MicroRNA miR-615 has been described to control angiogenesis in a range of ischemic cardiovascular disease models such as myocardial and limb ischemia. To help explore the pathobiology and mechanisms underlying key aspects of the angiogenesis in the context of myocardial and limb ischemia, we will generate nanomaterials targeted to these tissues for the site-specific delivery of an anti-miR to miR-615-5p.

R01HL133153 (McCarthy and Medoff) 07/01/2016-10/30/2020
NIH-NHLBI $220,775/year
Targeting Cell-specific Functions of the Rho Kinase Pathway in Pulmonary Fibrosis
This project focuses on the investigation of the Rho Kinase pathway in the promotion of pulmonary fibrosis. This will be investigated using transgenic model systems, subsequently confirmed using targeted nanomedical approaches.

Tucker, Ph.D., Nathan

K01 HL140187 (Tucker, Nathan) 04/01/2018-03/31/2023
NIH-NHLBI $167,400/year
Defining the functional variation underlying atrial fibrillation risk
Role: PI
Goals of this project include 1) Generating epigenomic maps of the human left atrium, 2) comprehensively evaluating functional variation at top AF association loci using massively parallel reporter assays, and 3) Identifying the left atrial gene targets of AF association loci using allelic imbalance measurements by allele-specific in situ hybridization and targeted RNA-sequencing.

20IPA35360132 (Tsai, Emily) 07/01/2020-06/30/2022
American Heart Association Innovative Project Award $23,439/year
The causal role of atrial fibrillation in right heart dysfunction: mechanisms of atrial-ventricular cell signaling
Role: Co-Investigator
This project aims to assess the effects of chronic atrial fibrillation on right ventricular function through a novel mouse model which knocks out Lkb1 in the heart. Dr. Tucker's laboratory will characterize the single cell transcriptomic profiles of atrial and ventricular cells in response to the gene knockout.

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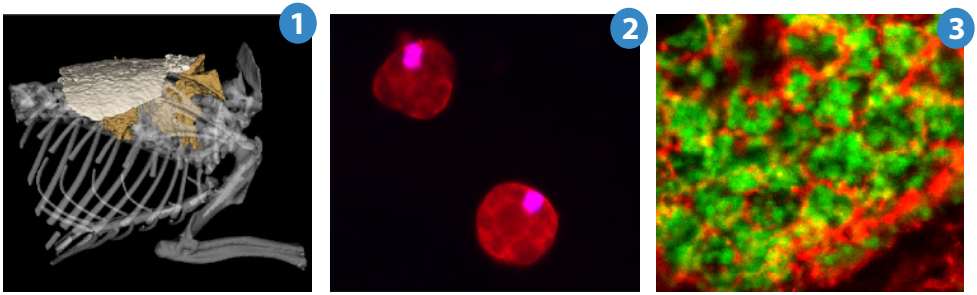

Images taken by Assistant Professor, Dr. Zhiqiang Lin. Brown adipose tissue is used to fuel our bodies, consuming lipids to keep us warm. Activation of brown adipose tissue has been deemed an efficient way to reduce obesity. Image 1: a mouse-model imaged using micro CT shows the presence of brown adipose tissue in the interscapular region of the tissue. Image 2: Isolated brown adipocytes show its complex membrane structure, which wraps around stored lipids. Image 3: Brown adipose tissue section stained with cell border marker (red) and lipid dye (green) displays the intracellular structuring of brown adipocytes.

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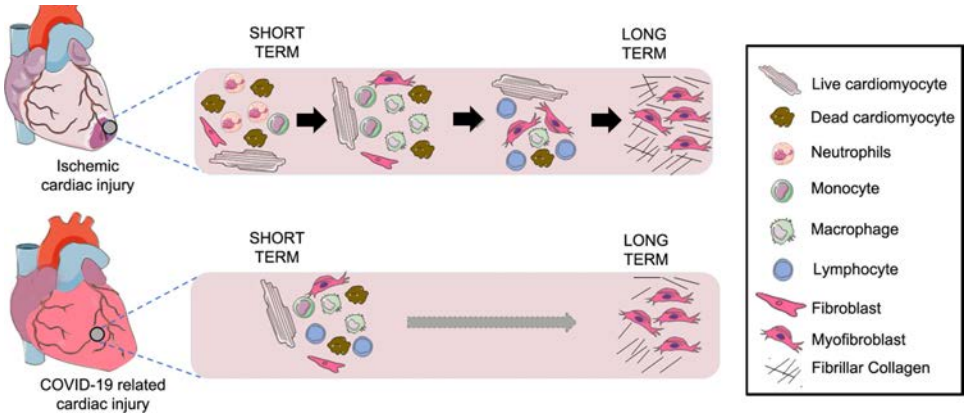
MMRI SCIENCE IN ACTION

The modernization of our facility, science and technology transformed the Institute into a 21st century interdisciplinary, translational research facility. Our researchers have expanded their studies to incorporate, along with preexisting cardiac research, ways to combat diabetes and obesity, autoimmune disease, neurocognitive disease, and cancer. All this was made possible due to the philanthropic generosity of the Masonic Fraternity and our other benefactors, whose support is helping our scientists pave the way for future medical breakthroughs.



Dr. Sathya Unudurthi, Instructor, recently published a review on the potential long-term cardiac effects of COVID-19. Studies show 35-40% of all COVID-related deaths are due to underlying cardiac disease. His review discusses the short-term and potential long-term cardiovascular complications associated with COVID-19 infection.

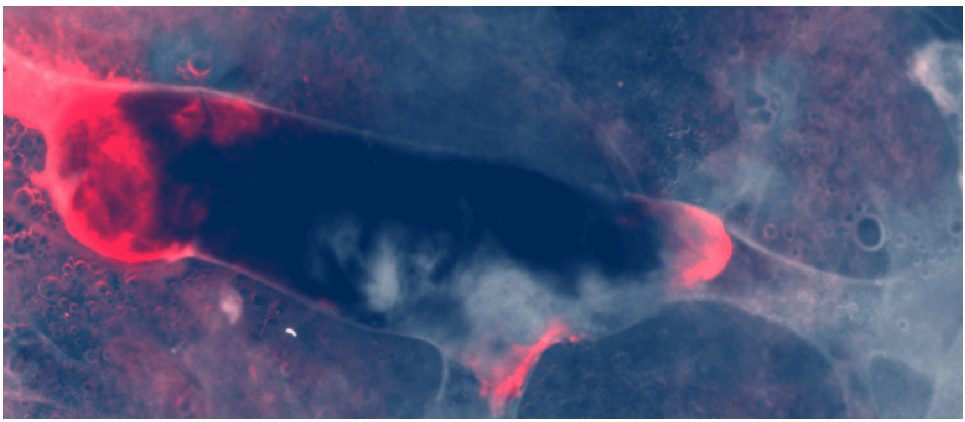
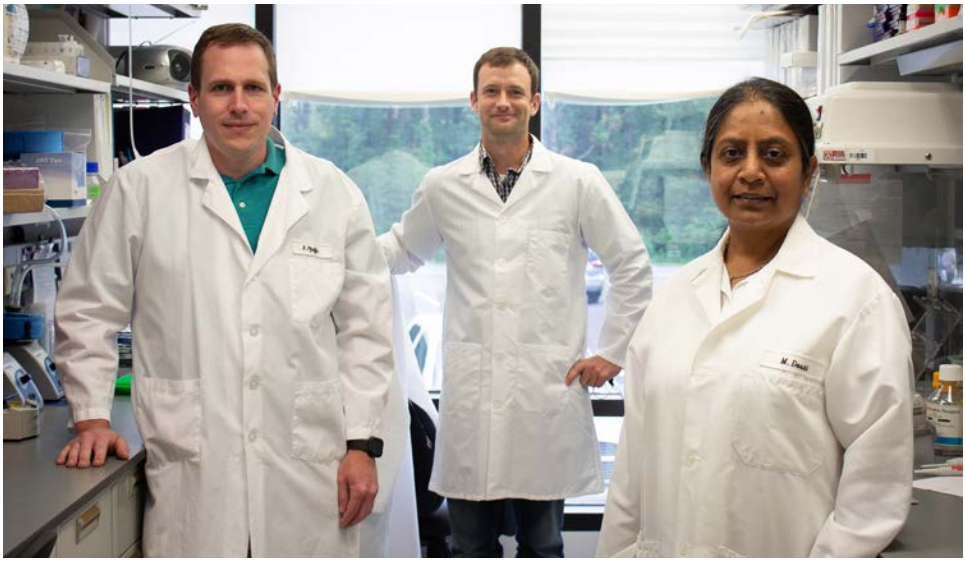


Image taken by Dr. Chase Kessinger, Instructor. Pictured above is a pulmonary embolism in resected lung tissue. The pulmonary embolism is coated with a fluorescent fibrin-target molecular imaging agent, shown in red. Targeting pulmonary embolism by fibrin allows for the visualization of the blood clot in living subjects.

MMRI SUPPORTS COMMUNITY COVID-19 BATTLE

Like many other organizations, the COVID-19 pandemic affected the immediate direction of MMRI's work. In response to the virus, many of our faculty quickly pivoted their research to assist as much as possible. Additionally, we sought numerous ways to help our local community combat the pandemic.



Ryan Pfeiffer, Research Associate (left), Nathan Tucker, Ph.D., Assistant Professor (middle), and Mayurika Desai, Research Assistant (right), are our devoted team conducting COVID-19 testing for MVHS.

Since June 1, 2020, the team has successfully conducted over 42,000 PCR tests, with an average turn around time of 10 hours.

Members of MMRI Board of Directors volunteered their time to help MMRI with COVID rapid testing. Pictured here is Board Chairman, R:.W:. David F. Schneeweiss, with Dr. Jason McCarthy, Associate Professor. In November, MMRI was approved to operate a rapid COVID-19 testing site at our facility in Upstate New York.

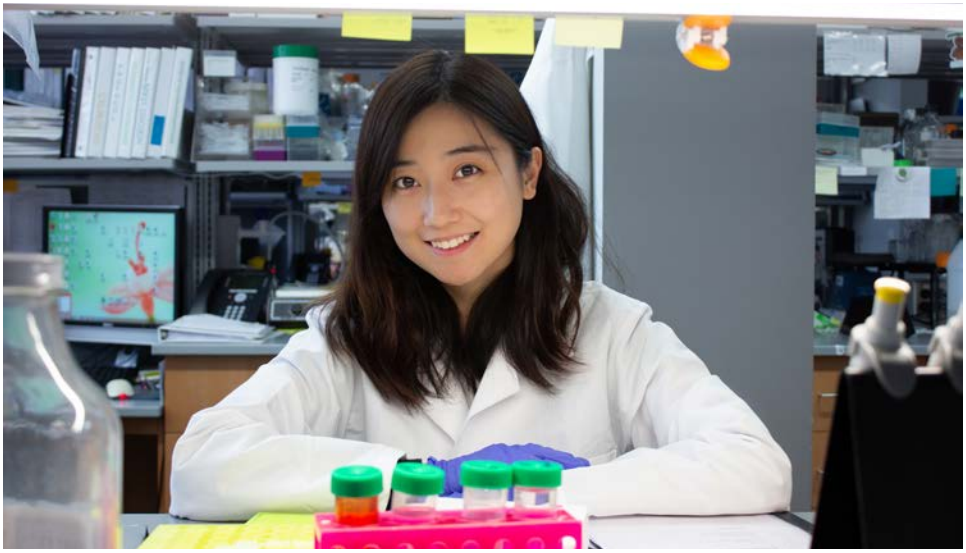
Dr. Khanh Ha, Postdoctoral Fellow in the McCarthy Lab, analyses a rapid COVID-19 test to determine results. The rapid testing service operates in numerous steps. Analysis is the fourth step, followed by data input, the final step before results can be viewed by the patient. Results are sent to the patient within half an hour of receiving their rapid test.

GRAND MASTER SARDONE SUPPORTS MMRI SCIENCE

Grand Master of the State of New York, M:.W:. William M. Sardone, likes to keep up with the science when visiting the Institute. Here, Dr. Sathya Unudurthi teaches him how to pipette; a common technique used in most scientific experiments.

Pictured here, Dr. Maria Kontaridis illustrates her research projects to Grand Master William M. Sardone, explaining commonly used tools and why they are important to running a successful and accurate experiment.

DR. YAN WINS HALFOND-WEIL POSTDOCTORAL FELLOWSHIP



Postdoctoral Fellow, Dr. Yan Sun, was the winner of the first ever Halfond-Weil Postdoctoral Fellowship. This now annual $50,000 award is made possible thanks to a generous endowment provided by the 8th Manhattan Lodge in New York City. The competitive Fellowship will be awarded to a top-talented postdoctoral researcher at MMRI, to help support their salary and project materials for one year.

DRS. AWARDED $300,000 GRANT FOR AUTISM RESEARCH

Dr. Gulhan Ercan-Sencicek, Instructor (left), and Dr. Maria Kontaridis, Executive Director (right), were awarded a $300,000 grant from the American Heart Association to study a possible link between cardiac abnormalities and autism. Results from the experiment will help the Drs. identify potential novel therapeutics that can be used to treat patients.

MMRI RENOVATIONS

In 2018, the MMRI began a season of growth and rebranding. Phase I renovations created 6,800 square feet of new, state-of-the-art laboratory space. This project repurposed under-utilized space within the existing laboratory and set the stage for Phase II, fully completed this summer. We are now well-poised to begin Phase III (slated to begin in late summer 2021), where upon completion, we will have fully renovated every square inch of our existing building. From the inside to the outside, the Institute stands transformed, marking the immense growth of the MMRI within the past few years and pointing towards the exciting future of what is yet to come.

Phase II of our multi-phase construction project reached the finish line in 2020 with new laboratory space on the basement level. The space made room for an additional 5,500 square feet, including 7 new lab bays or stations in which researchers can house their work and materials.

New state-of-the-art research space completed during phase II of construction at MMRI. In addition, the basement houses advanced technology equipement, ultra-low-temp freezers, and a modern glass wash and autoclave area.

Our newly renovated front lobby now includes comfortable seating, a conference area, and an official MMRI merchandise store front. Donated by our Executive Director, Dr. Maria Kontaridis, this space is multi-faceted, acting as a relaxing waiting area for visitors, a temporary workspace for employees looking to find a change of scenery and spark fresh inspiration, an interview studio, and more.

Staff enjoyed the newly constructed veranda that was made possible thanks to R:.W:. David Schneeweiss, Chairman of the MMRI Board of Directors, who donated the funds necessary to build and furnish this lovely and cherished outdoor space.

JOIN MMRI

CORNERSTONE SOCIETY WITH A LEGACY GIFT

The ***Cornerstone Society*** acknowledges the foresight and generosity of our Freemasons and friends who have notified us of their commitment to our research and science education programs by including us in their estate or other planned gifts. These gifts often provide significant tax advantages, while allowing MMRI to plan with confidence.

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Donate to MMRI; we invest your donation and send you quarterly payments. When the gift is realized, MMRI receives the amount left in the trust.

BEQUEST

Designate a portion of your estate to MMRI in your will.

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Designate MMRI as the beneficiary of your policy.

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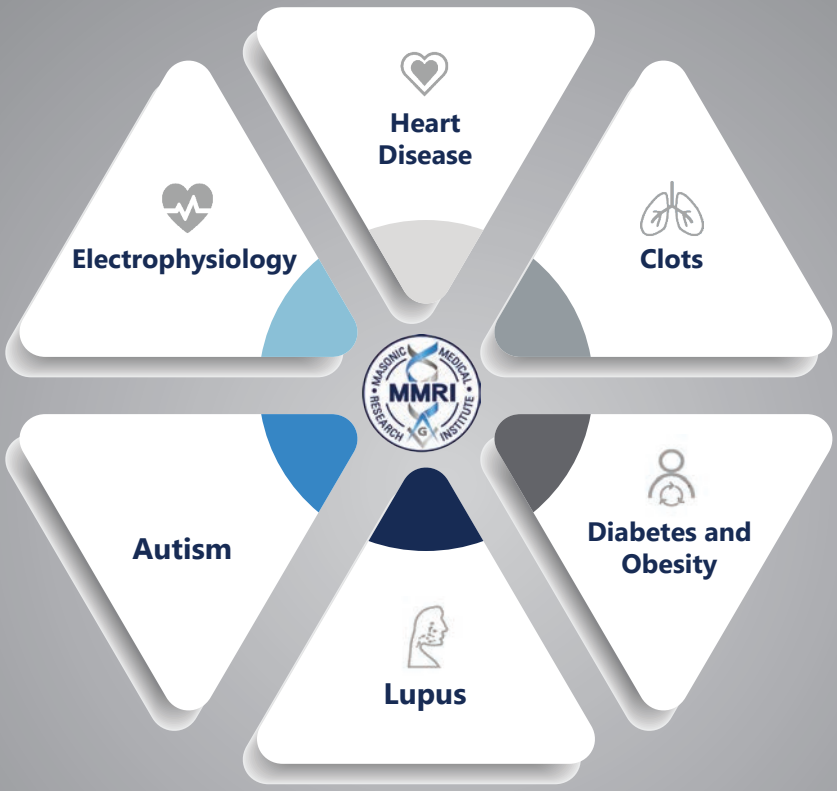
Designate MMRI as the beneficiary of your 403B/401K.

Join ***MMRI's Cornerstone Society*** Chair and Board Member, R:.W:. Sheldon B. Richman, by becoming a Charter Member, with a legacy gift that will have a lasting impact for generations to come.

To learn more about how you can make an impact, please visit: **mmri.edu/giving/**

SUPPORT MMRI

The generosity of our Freemasons and friends provides MMRI scientists with vital ÿnancial resources needed to conduct their innovative research. Every gift helps further build the foundation of our researchers unlocking the possibility of lifesaving discoveries and improving the health and quality of life for all of humankind.



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