



**ADVANCED SCIENCE RESEARCH CENTER  
THE GRADUATE CENTER  
CITY UNIVERSITY OF NEW YORK**



**Strategic Plan 2020–2024**

May 2020

# The Advanced Science Research Center (ASRC)

**at The Graduate Center, CUNY**

Strategic Plan 2020–2024

May 2020

# Contents

Introduction .....	1
ASRC Leadership .....	3
History .....	4
Key Outcomes From the First Five Years (2014–2019) .....	5
Vision and Mission.....	6
The Five ASRC Initiatives .....	7
Goal 1: Disciplinary Research in the Five Initiatives .....	8
Goal 2: Interdisciplinary Research.....	12
Goal 3: Integration of the ASRC Into CUNY-Wide Research and Education.....	15
Goal 4: Strategic Partnerships and Outreach.....	21
Goal 5: Financial Resiliency .....	25

# Introduction: ASRC embodies a bold vision for the future of scientific innovation



Since opening its doors in the fall of 2014, the ASRC has rapidly established itself as a major research enterprise in the New York metropolitan area, linking talented and ambitious scientists with top researchers from across CUNY as well as within and beyond New York City, in a state-of-the-art facility designed for collaboration.

The **ASRC Strategic Plan: 2020–2024** lays out an ambitious but achievable set of goals that will see the realization of the ASRC’s mission to nurture interdisciplinary research and education across CUNY over the next five years.

## Executive Summary

The updated **vision** of the ASRC is **to improve human, societal, and environmental well-being in the decades to come through excellence in interdisciplinary scientific discovery and education executed by an internationally recognized center of excellence.**

We seek to achieve our vision by pursuing the following **mission** over the next five years:

- To bring together leading scientists across five initiatives—Photonics, Nanoscience, Structural Biology, Neuroscience, and Environmental Sciences—to collaboratively address complex questions relevant to the most pressing challenges of their fields and society more broadly.
- To nurture a distinctive and inclusive research culture that is creative, collaborative, and convergent, with state-of-the-art facilities and an emphasis on training across STEM disciplines.
- To build on CUNY’s first-in-the-nation status as the engine of upward mobility for its large, diverse, and vibrant student body.

- To welcome scientists and students from all over the University, New York City and state, and the world to learn and contribute to our mission.

Our overall **strategy** to achieve distinction in the years to come is to identify scientific challenges of high societal importance that require our interdisciplinary skill set and to establish ourselves as a preeminent resource of expert knowledge in these areas. To do so, we will:

- Institute avenues to accelerate interdisciplinary research that will lead to new funded innovation centers/centers of excellence.
- Build a vibrant community of collaborators, within the ASRC and across CUNY through events and activities, core facilities, seed grants, and external multi-PI/large grant applications.
- Establish strategic partnerships with other academic, industry, and national organizations to support research, education, and workforce development.
- Develop new scientific instruments, interfaces, methods, etc. and pursue commercialization and technology transfer opportunities.
- Create advanced training curricula for undergraduates, master's and doctoral students, and post-doctoral scholars with The Graduate Center, CUNY, and other partners.
- Promote the ASRC and its research through media outreach, op-eds, and other vehicles.
- Engage with the public to inspire and promote interdisciplinary science through public engagement and educational events and connect with stakeholders to influence future policy.
- Secure the center's financial sustainability by increasing revenue from federal and nonfederal funding agencies; academic, industry, and nonprofit organizations; philanthropic organizations and donors; and core facility usage.

### **Acknowledgments**

Important contributions to this plan were made by members of the ASRC and the broader CUNY community, including:

Helene Bach (previously BMCC), Avrom Caplan (CUNY Central), Ronnie Ghose (CCNY), Brian Gibney (Brooklyn College, GC), Carmen Melendez (Hunter), Adam Braunschweig (ASRC), Shana Elbaum-Garfinkle (ASRC), Peter Groffman (ASRC), Ori Shafer (ASRC), Matthew Sfeir (ASRC), Ricardo Toledo-Crow (ASRC), Linda Vigdor (ASRC), John Blaho (CUNY Central), Tony Cak (ASRC), Bonnie Eissner (Graduate Center), Meghan Hughes (ASRC), Camille Santistevan (ASRC), Duke Shereen (ASRC), Brian Peterson (Graduate Center), Lori Duggan-Gold (Graduate Center), Eric Vieira (CUNY Central), Xi Chen (ASRC), Gabriele Grosso (ASRC), Daniel Keedy (ASRC), Azriel Genack (Queens College), Monica Trujillo (Queensborough Community College), Milan Begliarbekov (ASRC), Robert Campbell (Graduate Center), Adam Greenberg (ASRC), John Grzelewski (ASRC), and John Tsapogas (CUNY Research Foundation).

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# History



Located in New York’s world-famous neighborhood of Harlem, the striking 200,000-square-foot Advanced Science Research Center (ASRC) building embodies a bold vision for the future of scientific innovation. At the ASRC’s core is a world-class facility designed to inspire novel approaches to the scientific method itself — one that links talented and ambitious scientists with hundreds of top researchers from the 25 campuses of The City University of New York (CUNY) as well as colleagues within and far beyond the five boroughs of New York City.

The ASRC was conceived as a major capstone of the CUNY Decade for Science and subsequently realized through the leadership of then Chancellor Matthew Goldstein and Vice Chancellor for Research Gillian Small. The ASRC was designed to broadly accelerate CUNY research in five interdisciplinary areas that sought to build off the foundation of University faculty in photonics, nanoscience, structural biology, neuroscience, and environmental sciences. With its flowing floor plans and open central stairway, the ASRC building actively promotes cross-pollination of interdisciplinary science among these five core themes, thereby facilitating a vertical integration of big ideas. Researchers from all of the initiatives and CUNY campuses work side by side in the ASRC’s core facilities, sharing equipment that is among the most advanced of its kind anywhere in the world.

Since opening in the fall of 2014, the ASRC has emerged as a major research enterprise in the New York metropolitan area. At the same time, the presence of such a center at the University is a reminder of how targeted strategic investments in infrastructure can elevate the scientific research profile of a public, teaching-oriented institution. In January 2017, the administration of the ASRC was moved from the CUNY chancellery to The Graduate Center. As the accredited home of the University’s doctoral programs in the arts and sciences, and as a consortial school largely staffed by faculty appointed across CUNY’s 25 colleges, The Graduate Center has many inherent advantages to serving as the administrative home for the ASRC. The Graduate Center administers a range of administrative operations for the ASRC, including IT and library services. It also serves as the link with the chancellery and other key elements in the University’s central administration, which oversee annual budget allocations and other strategic areas. The addition of the ASRC also presents a strategic benefit to The Graduate Center, as its scientific research and faculty can be leveraged to enhance the profile of a number of related graduate programs.

In the fall of 2014, CUNY presented its five-year strategic plan for the first phase of the ASRC’s operations. This aspirational document highlighted the ASRC as a model of collaborative, interdisciplinary research within CUNY. Having achieved many of those early goals, the 2020–2024 five-year strategic plan builds on that initial foundation, highlights key successes, and lays out a vision for the future of the ASRC.

# Key Outcomes From the First Five Years (2014–2019)

Since its founding in 2014, the ASRC has emerged as a center of scientific excellence within the CUNY system, New York City, and beyond, as evidenced by the caliber of our faculty and their published research, our grant income, and the development of unique interdisciplinary approaches to address the most pressing research questions as well as urgent societal challenges.

**During its first five years of operation, the ASRC made strong progress toward realizing its ambitions, as illustrated by the following achievements:**

The ASRC has recruited **18 tenured and tenure-track faculty members** who represent the highest caliber of academic distinction, as documented by their hundreds of career and peer-society awards, their research results published in top-tier scientific journals, with more than 150 peer-reviewed publications in 2018 alone and more than 400 since its inception, and their growing recognition in the United States and worldwide.

ASRC faculty have fared exceedingly well in securing external funding within a very short time span. Hundreds of proposals have been submitted to federal agencies, companies, and private foundations. With an **annual funding growth rate of nearly 40%**, the center has received 127 awards and \$62 million in sponsored grants.

Through **15 individual core facilities**, the ASRC today hosts an outstanding collection of cutting-edge technologies and expertise available to academic and industrial users. More than 1,000 researchers have already used or been trained on ASRC instrumentation, much of which is unique to our region. At least 13 other CUNY campuses are represented among the active users of ASRC core facilities. The user base and corresponding income generated by these facilities is growing at a rapid pace.

The working relationships developing among the researchers in the center's five initiatives—including senior and junior faculty, post-doctoral scholars, and students from traditionally distinct academic backgrounds—make the ASRC a unique research institution, leading the way to **interdisciplinary research of the highest caliber**.

The ASRC has engaged with and **supported researchers across CUNY** through over 100 co-authored grant submissions, 58 seed grants awarded to non-ASRC CUNY faculty, and other collaborative activities, including co-mentorship of students, co-organizing and hosting scientific events and seminar series, and sponsoring faculty to conduct research during short-term residencies at the ASRC.

ASRC faculty contribute directly to CUNY's broader mission of education and upward mobility by **training graduate and undergraduate students** in cutting-edge research practices sought after by industry. Currently, the center is home to approximately 50 CUNY doctoral students, 10 master's students, and dozens of undergraduate students.

The ASRC is deeply embedded in **outreach activities, from engagement of local schools to community-based events** to major regional, national, and international symposia that have cumulatively drawn thousands of participants. Our Illumination Space is a particular draw for visitors. We have partnered with nearly 20 local middle and high schools as well as Borough of Manhattan Community College, LaGuardia Community College, Macaulay Honors College, New York City College of Technology, World Science Festival, Math for America, Girls Who Code, and the New York Hall of Science to teach a broad range of New York City students about STEM education. Graduate and undergraduate students also gain valuable experience teaching and communicating science by participating in and leading many of these interactions.

# Vision and Mission



## Vision

### The Vision of the Advanced Science Research Center is:

To improve human, societal, and environmental well-being in the decades to come through excellence in interdisciplinary scientific discovery and education executed by an internationally recognized center of excellence.

## Mission

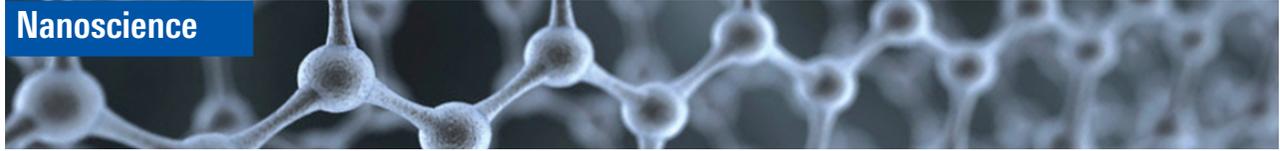
### The Mission of the Advanced Science Research Center is:

- To bring together leading scientists across five initiatives—Photonics, Nanoscience, Structural Biology, Neuroscience, and Environmental Sciences—to collaboratively address complex questions relevant to the most pressing challenges of their fields and society more broadly.
- To nurture a distinctive and inclusive research culture that is creative, collaborative, and convergent, with state-of-the-art facilities and an emphasis on training across STEM disciplines.
- To build on CUNY's first-in-the-nation status as the engine of upward mobility<sup>1</sup> for its large, diverse, and vibrant student body.
- To welcome scientists and students from all over the University, New York City and state, and the world to learn and contribute to our mission.
- Building a world-class research enterprise inside a public institution presents a number of challenges and unique opportunities. CUNY's primary mission—to address the educational needs of a large and diverse student population—propels a newly educated workforce into arenas of economic opportunity and higher socioeconomic strata. The ASRC shares this founding principle and integrates it into its mission of research excellence.

<sup>1</sup> "Colleges with the Highest Student-Mobility Rates, 2014", *The Chronicle of Higher Education*, August 19, 2018.

# The Five ASRC Initiatives

## Nanoscience



**Mission:** To serve as a world-leading center in the development of nanotechnology solutions that are inspired by and integrated with living systems. The initiative achieves this distinction through its focus on a “systems” approach to nanoscience designed through principles found in the living world to ultimately benefit society—in terms of improved industrial processes, environmental remediation, and human health.

## Photonics



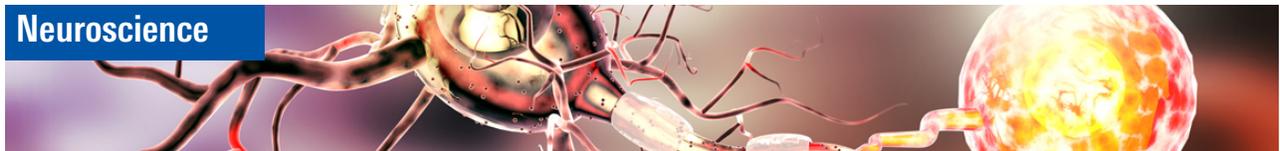
**Mission:** To serve as a world-recognized center for photonics/electromagnetics/wave physics research, making an impact from the fundamental understanding of light-matter interactions to applications in the next generation of computing, sensing, and communications technology.

## Structural Biology



**Mission:** To provide a first-class structural biology resource for scientists in the CUNY system and beyond, giving researchers inside and outside of the field access and insight to this interdisciplinary field intersecting biology, chemistry, and physics through our work, our facilities, and our expertise.

## Neuroscience



**Mission:** To conduct internationally recognized science in neurobiology with the goals of alleviating the societal burden of mental disorders, training students, and providing resources to CUNY and the local community in Harlem. The distinctive mission of the initiative is to study the impact of the environment on epigenetic regulation of gene expression and on the activity of neural networks in the brain, while creating innovative interdisciplinary solutions to diagnostic and therapeutic challenges.

## Environmental Sciences



**Mission:** To serve as a focal point for experts to join forces, to dialogue, and solve the major 21st-century strategic environmental challenges facing the region, the nation, and the world, capitalizing on state-of-the-art sensor, field, laboratory, and geospatial modeling techniques.

# Goal 1: Disciplinary Research in the Five Initiatives



**We will bring distinction to the disciplinary research taking place in our five initiatives through demonstrable increases in intellectual impact and funding.**

During the ASRC's first five years, its five disciplinary initiatives have been securely established as the foundation for growth and fulfillment of its overarching mission. Each focus area has distinguished itself at both the national and international levels, thereby strengthening CUNY's reputation in these research domains. These accomplishments are supported by several metrics of success, which are detailed in the narrative and statistics presented below. Collectively, the initiatives have created a clear forward momentum for the enterprise as a whole and a trajectory for its continued success in its disciplinary and transdisciplinary aspirations.

## FACULTY DISTINCTIONS AND REPUTATION

**Over their careers, ASRC faculty members have collectively received hundreds of awards and distinctions.**

ASRC faculty members serve on editorial boards of prestigious journals, have been elected as fellows to scientific societies, and regularly serve in leadership positions in their disciplines. They also participate in programmatic panels, consensus reports delivered to agencies, and briefings given to congressional and regional lawmakers, contributing expertise that influences science policy. ASRC faculty members disseminate research findings to the research community by giving seminars, lectures, and keynotes, and by organizing international conferences and symposia. In addition, the organization of events for local schools and outreach allows the ASRC to impact the local community in New York City's West Harlem neighborhood.

## STATE-OF-THE-ART FACILITIES AND RESOURCES

**The ASRC hosts a unique collection of cutting-edge technologies, comprising 15 individual core facilities that are accessible to CUNY and extramural researchers.**

More than 1,000 researchers have been trained to use the equipment in these cores. Growth in the user base and income generated by the core facilities hosting these technologies have been on an upward trajectory and are ex-

pected to continue to increase at a fast pace, especially as the newest of the 15 core facilities becomes operational in FY 2020. The ASRC will also recruit an expert in research computing to help advance its IT infrastructure and support, which are essential across all disciplines and for building collaborations across CUNY.

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## GRANT ACTIVITY

**ASRC faculty have been highly entrepreneurial and have fared exceedingly well in garnering significant grant funding.**

Given the ASRC's mission to further scientific knowledge with creative science and train the next generation of scientists, research funding is an essential part of the ASRC culture. ASRC faculty have shown an overall success rate of 32% in garnering funding (by comparison, federal agency funding rates are typically at or below 20%). Federal awards are especially critical, representing a gold standard in the research community. Significantly, more than four-fifths of the ASRC's \$62 million in funding has come from the Department of Defense, National Institutes of Health, and National Science Foundation, collectively.

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## PUBLICATIONS

**An important measure of success for any research enterprise is its presence in the peer-reviewed literature. ASRC scientists are distinguishing themselves in their disciplinary domains in several respects.**

Center faculty routinely publish results from their research in top-tier, high-impact journals. Over the span of their collective careers, they have published nearly 1,000 articles in such outlets. This means that center faculty and staff have been broadly cited by other researchers, collectively nearly 200,000 times. Annual citation numbers have increased by 45% during the center's first five years, highlighting the increased reach of their discoveries within the scientific community. Further, this year two ASRC faculty members—Andrea Alù and Matthew Sfeir—were named Highly Cited Researchers by the Web of Science Group.

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## COMMERCIALIZATION

**Emphasizing the potential for applying the ASRC's research discoveries, a number of ASRC faculty members have recently received patents for innovations created at the center.**

Several startup companies were formed as spinoffs to ASRC research team activities. Ongoing collaborations with industry, growth of industry-sponsored research, and industry use of the ASRC core facilities will pave the way for additional opportunities. The recent award to establish a New York State Center for Advanced Technology in the area of sensor technologies will also contribute to building university-industry partnerships and related workforce development programs.

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## STUDENT TRAINING

**The ASRC recently graduated its first cohort of graduate students, and the community of doctoral students working at the ASRC for their dissertation or using the core facilities is on the rise.**

Like their mentors, several ASRC students and postdoctoral researchers are themselves attaining a level of distinction as first authors or co-authors in leading scientific journals and recipients of individual research fellowships. Former postdoctoral fellow Ayala Lampel recently started her own independent laboratory as an assistant professor at Tel Aviv University. Also of note, Igor Dikiy, a postdoctoral fellow in the Structural Biology Initiative with Professor Kevin Gardner (GC/CCNY, Chemistry and Biochemistry), was recently named CUNY's first ever finalist for the prestigious Blavatnik Regional Awards. Students are increasingly co-advised by multiple mentors within the ASRC or across the CUNY campuses, which speaks to increasing interdisciplinary research and training. For example,

Professor Rein Ulijn (GC/Hunter, Chemistry), director of the Nanoscience Initiative, co-mentors a graduate student with Professor Stephen O'Brien (GC/CCNY), studying design of nanoparticles for cancer therapeutics and diagnostics, and Professor Charles Vörösmarty (GC/CCNY; Earth and Environmental Sciences/Civil Engineering), director of the Environmental Sciences Initiative, and Professor Zhongqi Cheng (GC/Brooklyn College, Earth and Environmental Sciences) co-mentor a doctoral student from the earth and environmental sciences program. In addition, multiple students combine neuroscience and structural biology to understand protein phase separation in neurons and genetically encoded, light-activated "on-off switches" for neuronal activity.

## ADDITIONAL MEASURES OF SUCCESS

### **Additional measures and indicators of success point to the positive trajectories in each of the ASRC disciplinary areas.**

Because of its New York City location and outstanding conferencing facilities, the center has already distinguished itself as an ideal venue for national and international conferences. In addition to meetings hosted by ASRC faculty, we have hosted repeated events for the New York City Regional Innovation Node, Girls Who Code, Phantoms Foundation, and the New York Structural Biology Center. News of ASRC research is also reaching the public through press releases, public talks, podcasts, and media outlets.

Social media is now an important avenue for building recognition, and with over 300,000 impressions, 5,000 active engagements, and hundreds of new followers on Twitter over the past year, the center is also taking advantage of this resource effectively.

## Objectives

**To build on our reputation as a regional, national, and international center of excellence in research and education within and across the five initiatives, and to advance these domains of scientific inquiry by employing the center's intellectual and state-of-the-art technological resources, we will:**

- Create a vibrant community of collaborators from the CUNY campuses as well as extramural institutions.
- Further develop a platform for advanced training of undergraduates, graduate students, and postdoctoral scholars.
- Establish the center as a preeminent resource of expert knowledge for business, government, and the public at large.

## Implementation Plan

**To pursue the above objectives, we will:**

- Ensure high visibility and accessibility of the ASRC facilities, both within CUNY and beyond, by broadly advertising these resources through open house visits and multi- and single-campus in-person or electronic seminars.
- Expand the use of the center as a strategic meeting point for experts who are connected to our disciplinary and interdisciplinary areas of interest and who broaden our scientific perspectives and networks, including use of excellent meeting facilities to host conferences (e.g., ASRC auditorium) and laboratory space to support national and international sabbatical fellows.
- Continue and further accelerate the demonstrated level of grant success through a dedicated effort to identify all appropriate federal, state, foundation, and local funding announcements.

- In parallel, identify funding opportunities that support collaborative disciplinary research with other CUNY faculty as well as grant support for cross-campus training programs.
- Continue to build our online presence through the ASRC website and social media to garner widespread recognition for accomplishments.
- Work with The Graduate Center to attract the best domestic and international university students and to attract a diverse graduate student body by helping with recruitment, raising appropriate stipend funding, and supporting workforce development.
- Apply for appropriate federal training grants to support disciplinary research across CUNY, in partnership with The Graduate Center and colleagues throughout the CUNY system, including National Institutes of Health Institutional Training Grants and National Science Foundation Research Traineeships.
- Identify, support, and then promote a select number of high-impact discoveries from each initiative that establish a reputation for the ASRC in these areas.
- Establish a clear plan for media coverage of publications, awards, and other accomplishments from the ASRC that will support reputation building in identified areas.
- Pursue public-private partnerships and opportunities to patent, commercialize, and/or disseminate discoveries for the public good of society.
- Continue ongoing outreach activities to educate the local community, particularly middle and high school students, about STEM and continue to build a reputation with the public as an important proponent of STEM research and education.
- Identify opportunities to support 21st-century, societally relevant policies and decision-making in high-end technology, medicine, and environmental management.

## Goal 2: Interdisciplinary Research



**The ASRC’s collaborative model will enable researchers to execute state-of-the-art, interdisciplinary, convergence research that shatters the boundaries of traditional disciplines.**

Researchers at the ASRC conduct research that spans spatial and temporal scales by 17 orders of magnitude—from centuries to picoseconds and from nanometers to kilometers. In its first five years, the ASRC has surpassed initial expectations and established itself as a leading interdisciplinary science institution with the explicit goal to promote cross-fertilization and to break down traditional silos between distinct disciplines. The five initiatives are diligently working to overcome barriers that would normally hinder integration across their diverse scientific disciplines and have established mechanisms to communicate with a new integrative scientific language. Through collaborative activities and discussions catalyzed within faculty meetings, building-wide events, and informal gatherings, faculty members, trainees, and staff are creating a new culture of collaborative research and are formulating concrete plans and projects dedicated to interdisciplinary research. A prime example of the ASRC’s success is the recent establishment of the Center for Advanced Technology in Sensors for Exploration of Natural Systems and Environments, funded by Empire State Development and involving participation from all five initiatives.

### Objectives

**To further integrate the strengths emerging from each scientific discipline and transform these into a coherent program of interdisciplinary research, the ASRC will:**

- Identify scientific challenges whose solutions require interdisciplinary approaches and will have significant societal impact, for example, development of tools to analyze soil greenhouse gas remediation; design of novel sustainable energy sources and quantum computers; study of climate adaptation, environmental protection, and the interaction of the environment with brain, gut, and immune systems; and creation of novel diagnostic sensors and tools for neurological and mental health disorders and cancer.
- Create appropriate vehicles to accelerate interdisciplinary research in identified areas, potentially modeled after the successful launch of the Center for Advanced Technology focused on advancing communication and sensing technologies that address critical needs in biomedical and environmental sciences.

- Design and develop new scientific instruments, interfaces, and methods to address identified interdisciplinary research needs.
- Further develop and implement events and activities that explicitly promote and nurture collaborations across floors and labs within the ASRC as well as with CUNY collaborators, creating a meeting ground for innovative discussions on interdisciplinary research and a University-wide resource for the exchange of scientific information.
- Augment CUNY's graduate and undergraduate programs through the creation of interdisciplinary research training curricula to support the next generation of interdisciplinary scientists and promote STEM education.
- Create opportunities to attract and support talented postdoctoral fellows interested in interdisciplinary work by creating fellowship programs funded via grants and/or philanthropic support.
- Engage with the local community to inspire and promote interdisciplinary science through public engagement and educational events that provide information about how interdisciplinary science seeks to improve human, societal, and environmental well-being.
- Promote the ASRC in the philanthropic and venture capital/business communities to grow a unique fundraising capacity by highlighting the importance and promise of interdisciplinary science.

## Implementation Plan

The ASRC is well positioned to establish unique centers of scientific excellence that leverage its strengths across multiple disciplines within the center as well as across CUNY. In its next five-year phase of development, the ASRC will identify and pursue the next "big" interdisciplinary ideas that build on these strengths and link scientific research, education, and societal impact. Working with colleagues in The Graduate Center and beyond, the ASRC will create new virtual centers not bound by geography and of scientific excellence at these strategic intersections.

These virtual centers will coordinate scientific efforts to maximize the impact of interdisciplinary research that, for example, unites molecular and cellular technologies with global-scale approaches. In particular, the ASRC brings together the ideal combination of researchers to study living materials with nanoscale and photonic functionalities with the goal of establishing links between environmental effects, behavior, and disease. Working together, researchers will have the potential to impact the development of functional biomaterials for health and environmental sensing, molecular switches to modulate environmental effects on genetic material, and strategies to address competing energy, environmental, and natural resource demands.

**To excel in this area, ASRC leadership will develop effective solutions to reduce potential barriers to its continued success and growth. Among these:**

### Balance Disciplinary and Interdisciplinary Excellence

It is critical to identify the right balance for ASRC faculty members to allocate their time and effort between building and retaining excellence in their relative fields of study and promoting and conducting innovative interdisciplinary research. Given the combination of disciplines at the ASRC, these new research programs will be quite unique and, in terms of funding and successful outcomes, will often be high risk.

### **Maximize Use of ASRC Meeting Space to Catalyze Interdisciplinary Dialogues**

The ASRC houses a number of formal and informal collaboration spaces that encourage collaboration and interaction among its researchers and visiting scientists. The ASRC Café offers a space for relaxed and informal, but regular, daily interactions across the community, including staff, students, and faculty. And it can be even better used to foster spontaneous and diverse conversations and exchanges around ideas that live among the labs and groups distributed across the five floors. ASRC conference rooms will also be equipped to support an increased need for teleconferencing to connect interdisciplinary collaborators from other CUNY campuses.

### **Identify and Pursue Funding to Facilitate Interdisciplinary Research**

A number of federal funding opportunities are positioned to support collaborative and interdisciplinary research. The National Institutes of Health supports a variety of center grants, the Department of Defense sponsors the Multidisciplinary University Research Initiative program, and the National Science Foundation funds interdisciplinary science and technology centers, to name a few. To become competitive for these significant awards, the ASRC will need to identify mechanisms to support the initial stages of interdisciplinary collaborations and collection of preliminary data. A combination of internal and nonfederal opportunities will be pursued.

### **Enhance Existing ASRC Facility Infrastructure to Support Interdisciplinarity**

The ASRC hosts state-of-the-art instrumentation and infrastructure to support world-class interdisciplinary scientific research. To remain at the forefront, the center will need to continually evaluate the changing needs of the community it supports at the ASRC and throughout CUNY. While there will be a need for new instruments and updated facilities, the center can also identify ways to repurpose existing components for new, transdisciplinary research by expanding their design limits to address multiscale, interdisciplinary research problems. Recently, the directors of the Epigenetics and Mass Spectrometry (MS) facilities recognized the need and their ability to join forces to create a Matrix-Assisted Laser Desorption Ionization (MALDI)-MS Imaging Facility using their combined expertise and instrumentation. This new core facility allows for label-free in situ profiling of proteins, lipids, metabolites, and small molecules.

### **Design Advanced Interdisciplinary Educational Programs to Train CUNY Students**

World-class interdisciplinary research also requires a workforce that is trained to understand its particular demands and challenges. In partnership with existing graduate programs, the ASRC will spearhead the creation of new interdisciplinary programs for graduate education that will reflect these needs, expand the opportunities for CUNY students, and prepare them for unique career paths. These new programs will enable students and other researchers to understand a common scientific (technical) language, recognize and evaluate research outside traditional field boundaries, and establish familiarity with diverse methods and tools in order to apply them in interdisciplinary approaches. They will also include connections to real-world applications and, through partnerships and internships, exposure to career paths within and outside academia. These programs will include doctoral students working at the ASRC and across CUNY, thereby stimulating research across the University. Undergraduate and master's students can also benefit from these new educational programs by participating in the programs' events, professional development opportunities, and courses as well as by engaging in interdisciplinary research at the ASRC. Faculty have already begun to build the foundations of these programs. For example, two faculty co-taught a course that combines environmental sciences and chemistry that, among other things, guides students in understanding their interactions in real-life challenges, such as the impacts of nanoplastics in the air and oceans.

### **Graduate Student and Postdoctoral Fellow Support**

Progress will be accelerated by securing funding for outstanding young trainees dedicated to interdisciplinary studies. There is a need to generate dedicated funds to support scholarships for doctoral and postdoctoral fellows to work on interdisciplinary research, which is not traditionally supported by conventional funding sources.

# Goal 3: Integration of the ASRC Into CUNY-Wide Research and Education



**We will integrate the ASRC into the culture and agenda of CUNY by encouraging faculty and students to leverage the center's outstanding collection of cutting-edge technologies to enhance their research programs and their contributions to the modern scientific workplace within and beyond New York City.**

Within the past five years, the ASRC has begun to fulfill its mission to be a premier, CUNY-wide scientific and educational resource by pursuing a multipronged strategy that ranges from opening state-of-the-art research labs and core facilities to the broader community, to providing seed program funding to CUNY researchers to take advantage of these opportunities, to training graduate and undergraduate students and hosting high-profile seminars and symposia in partnership with CUNY faculty and students. As such, many view the ASRC faculty, staff, and students as making positive contributions to the research and education mission of the University. Despite inherent challenges resulting from geographic distances that separate the campuses and administrative systems, progress has been made through the hard work of many individuals throughout the CUNY system collaborating directly with members of the ASRC. Importantly, The Graduate Center dean for the sciences is a constant advocate for the ASRC among the colleges, and The Graduate Center president and provost work to support and advertise the ASRC's integration at the university level. Further, the strategic appointment of nine ASRC faculty to senior colleges, including Brooklyn College, Hunter College, Queens College, and The City College of New York, has helped broaden the reach of the ASRC through teaching, service, and networking. By 2018, the ASRC also had more than 100 officially designated affiliates (most from other CUNY campuses), and these partnerships have already led to co-authored grants and publications between faculty at the ASRC and other CUNY campuses. An evaluation of the current status identifies many positive achievements along with some important challenges.

## STATE-OF-THE-ART RESEARCH LABS AND CORE FACILITIES

The ASRC opened 15 core facilities in its first five years. Under the direction of expert research faculty members, the core facilities have acquired advanced instrumentation and established a suite of unique services and applications that are preferentially available to CUNY scientists.

Hundreds of CUNY scientists from outside the ASRC are users of these core facilities, including faculty and students from Baruch College, Borough of Manhattan Community College, Bronx Community College, Brooklyn College, College of Staten Island, Hostos Community College, Hunter College, John Jay College of Criminal Justice, Kingsborough Community College, Lehman College, Queens College, The City College of New York, and York College—with new users continuing to join.

Numerous CUNY faculty members have been hosted at the ASRC for activities ranging from mini-sabbaticals to temporary moves to accommodation of construction-related inconveniences on their home campuses. Faculty members taking advantage of these opportunities have so far come from Baruch College, Brooklyn College, Hunter College, Queens College, and Queensborough Community College.

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## ABOUT OUR CORE FACILITIES

### Advanced Laboratory for Chemical and Isotopic Signatures (ALCIS)

**Director:** Brian Giebel, Ph.D., *Research Assistant Professor*

**Research Interests:** atmospheric chemistry, geochemistry, isotope ratio mass spectrometry, gas chromatography, stable isotope reference standardization and calibration techniques

### Biomolecular Nuclear Magnetic Resonance (NMR) Facility

**Director:** James Aramini, Ph.D., *Research Associate Professor*

**Research Interests:** Protein structure and dynamics using Nuclear Magnetic Resonance spectroscopy, metabolomics, characterization of chemical material by solution and solid state NMR

### Comparative Medicine Unit (CMU)

**Directors:** Sulli Popilskis, DVM, *Attending Veterinarian*; Isela Lopez, LVT, *Operations Manager*

**Research Interests:** Office of Laboratory Animal Welfare and United States Department of Agriculture oversee the facility for the humane care of research laboratory animals

### Epigenetics Facility

**Director:** Jia Liu, Ph.D., *Research Associate Professor*

**Research Interests:** Epigenetic regulation of glia and neurons, and effects of stress on gene expression changes

### Imaging Facility

**Director:** Tong Wang, Ph.D., *Research Associate Professor*

**Research Interests:** Electron microscopy, cryo-EM, single particle reconstruction, protein structures, DNA, self-assembly, bio-nanotechnology

### Live Imaging and Bioenergetics Facility

**Director:** Ye He, Ph.D., *Research Assistant Professor*

**Research Interests:** Confocal microscopy, two photon, live imaging, super resolution imaging, 3D/4D imaging, MALDI MS imaging, glial development and diseases, brain tumor, ion channel, Drosophila neuronal development

### Magnetic Resonance Imaging (MRI) Facility

**Director:** A. Duke Shereen, Ph.D., *Research Associate Professor*

**Research Interests:** Structural and functional neuroimaging (MRI, EEG), neuromodulation (TMS/TDCS), brain development and aging, imaging biomarkers, neurodegenerative diseases, speech and language, memory, cognition, multimodal and simultaneous MRI/EEG/TMS/TDCS/eye-tracking/physiological-sensing methods development

### MALDI-TOF MS Imaging Facility

**Directors:** Ye He, Ph.D., *Research Assistant Professor*; Rinat Abzalimov, Ph.D., *Research Assistant Professor*

**Research Interests:** Label-free in situ profiling of proteins, lipids, metabolites and small molecules; MALDI imaging including tissue preparation, matrix coating, MALDI-MS profiling, and imaging/data analysis

### Mass Spectrometry Facility

**Director:** Rinat Abzalimov, Ph.D., *Research Assistant Professor*

**Research Interests:** Biomolecular mass spectrometry, protein structure and dynamics via HDX-MS and intact mass measurements, macromolecule/liquid interactions, metabolomics, and mass spec-based imaging

### Microbial Ecology and Genomics Facility

**Research Interests:** Genetics, molecular biology, biochemistry, and genomics of unicellular microorganisms

### Nanofabrication Facility

**Director:** Milan Begliarbekov, Ph.D., *Research Assistant Professor*

**Research Interests:** Lithography, thin film deposition, dry etching, metrology, thermal processing, and characterization

### Next Generation Environmental Sensor Lab (NGENS) and Observatory

**Director:** Ricardo Toledo-Crow, Ph.D., *Research Associate Professor*

**Research Interests:** Environmental sensor development and calibration, sensor deployment, in situ sensing, remote sensing

### Photonics Facility

**Director:** Alex Krasnok, Ph.D., *Research Assistant Professor*

**Research Interests:** Lasers, light sources, measurement instruments, optical and mechanical hardware, photonics-related software packages for computational work

### Radio Frequency & Millimeter-wave (RF/mm-wave) Facility

**Director:** Younes Ra'di, D.Sc., *Research Assistant Professor*

**Research Interests:** In-house PCB prototyping, anechoic test chamber, high-end spherical nearfield measurement system, planar nearfield scanning

### Rodent Behavioral Analysis Suite

**Director:** Jia Liu, Ph.D., *Research Associate Professor*

**Research Interests:** Behavioral analysis in models of neurological and psychiatric disorders, including learning, memory, anxiety, and depression tasks

### Surface Science Facility

**Director:** Tai-De Li, Ph.D., *Research Associate Professor*

**Research Interests:** Soft materials, nanobioscience, nano-rheology, mechanobiochemistry, nano-surface science

## SEED GRANTS

**The establishment of the ASRC Seed Grants in 2014 has been particularly important and is a major mechanism for encouraging CUNY scientists to take advantage of the facilities and resources at the ASRC.**

These grants match research-active faculty across the campuses to ASRC partners, who then jointly execute preliminary experiments with the goal of generating preliminary data for external grant applications and/or publishable results. The ASRC Seed Grant Program attracts a broad cross section of research-active CUNY faculty, just as the program was originally conceived. To date, the ASRC has awarded seed grants to 56 CUNY faculty from 12 different campuses. CUNY awardees have gone on to publish the data collected and receive external grants from the National Institutes of Health and the National Science Foundation, in fulfillment of the program's overall goals. Virtually all of the submissions are to single initiatives and thus have become a mainstay of cross-campus departmental engagement.

## EDUCATION

**ASRC faculty have been integrated into the senior colleges and The Graduate Center through their teaching and service.**

This includes teaching undergraduate-level science courses at City College, Hunter College, Queens College, Brooklyn College, and LaGuardia Community College, among others, and actively participating in The Graduate Center's science doctoral-degree programs, including biochemistry, biology, chemistry, earth and environmental sciences, and physics. Faculty also co-mentor doctoral and master's students with colleagues at most of the senior colleges.

Since 2016, the ASRC has increased its level of engagement with community college faculty and students. In this context, ASRC faculty and staff have been strongly supportive of undergraduate education via participation in a variety of summer programs (e.g., CUNY Summer Undergraduate Research Program, National Science Foundation's Research Experiences for Undergraduates, and CUNY-IBM Business-Higher Education Forum summer fellows) that engage individual students in ASRC labs as well as through involvement in the development of and participation in the IlluminationSpace. The IlluminationSpace has also brought in students from Borough of Manhattan Community College and LaGuardia Community College for STEM education events. ASRC faculty have organized scientific events of varying scopes (e.g., workshops, symposia, and seminar series), which have encouraged the on-site and remote participation of literally thousands of CUNY faculty and students.

## Objectives

**To enhance the integration of CUNY faculty, students, and staff into the ASRC's interdisciplinary research and educational activities, and to collaboratively define unique opportunities for cross-campus convergence, we will:**

- Continue outreach to CUNY schools and colleges to build recognition of the ASRC as a common resource and encourage active use of its facilities.
- Further support for research of CUNY faculty and students, in terms of core facility use, seed grants and scholarships, letters of grant support, and co-sponsorship of grants.
- Engage faculty and students across CUNY at ASRC-sponsored symposia, seminars, and workshops and co-sponsorship/co-organization of events by ASRC and non-ASRC faculty.
- Support recruitment and programmatic needs of The Graduate Center science doctoral programs.

- Promote CUNY undergraduate and master's students to participate in ASRC-based research via programs such as the CUNY Research Scholars Program; the CUNY Summer Undergraduate Research Program; and National Science Foundation's Research Experiences for Undergraduates hosted by the Center for Interface Design and Engineered Assembly of Low Dimensional Systems, the Materials Research Center, and the program in Biochemistry, Biophysics, and Biodesign.
- Participate in teaching and service at the campuses by ASRC faculty, including course/workshop lecturing and organization, formulation of new courses, co-teaching of classes, and service on graduate student dissertations and other committees.

## Implementation Plan

There are challenges intrinsic to building collaborations across a complex, multicampus university system, and there are limits to what one element of that system, such as the ASRC, can achieve. There are also adaptation strategies, which need to be developed, that accommodate the evolving mosaic of organizational structures, leadership changes, and administrative processes.

**Some potential solutions, both in terms of mitigation and practical accommodation, are outlined below:**

### Continue and Strengthen Outreach to The Graduate Center and other CUNY Campuses

We will proactively seek out opportunities for ASRC faculty to be engaged in teaching and service at both the senior colleges and community colleges, both to promote dialogue and to share work as appropriate to career stage. In particular, we will reestablish the ASRC Internal Advisory Committee to promote communication, and we will directly engage with Graduate Center executive officers as well as science department and program leaders across CUNY. We also see a need to assemble working groups that include stakeholders from the ASRC, The Graduate Center, and other campuses to address specific, recurring challenges.

### Increase Core Facility Use

Given the importance of making the core facilities available to members of the CUNY community of bench scientists, it will be important to ensure adequate input from that community. Therefore, it is proposed that all ASRC cores have advisory panels comprising mainly CUNY users, which will be provided with annual overviews of operations and given ample opportunity to provide input on the strategic directions of these facilities. We will also host core facility open houses at ASRC and Graduate Center events that would otherwise draw in faculty and students from other campuses, and continue to promote the core facilities through our website and print flyers disseminated to relevant science departments.

### Continue to Partner with CUNY Faculty to Host Scientific Events

We have had success co-organizing symposia and seminars and have drawn significant numbers of CUNY faculty and students as attendees. Initiating a poll to gain further insights into the areas of interest, practical issues, and logistics will help us develop additional events.

### Engage in Ph.D. Student Recruitment Efforts

Faculty members from the ASRC will focus additional resources to coordinate with Graduate Center executive officers in order to pursue recruitment efforts targeted at improving the quality and quantity of the incoming classes. This will have direct benefit to the talent pool of young researchers at ASRC as well as to all research-active groups in CUNY who are affiliated with The Graduate Center and its programs. As we consider new interdisciplinary educational programs, described earlier, we will work with relevant faculty from across CUNY to capitalize on unique opportunities at the ASRC that resonate with strengths elsewhere in the University.

### **Identify Additional Opportunities to Engage with Undergraduate and Master’s Students**

The ASRC already hosts dozens of undergraduate students from a variety of senior and community colleges. Many of these come to us through programs, such as the CUNY Summer Undergraduate Research Program. There are also about a dozen master’s students working with ASRC faculty. We will continue efforts to identify strategic partnerships with CUNY colleges where the ASRC can provide unique additional training opportunities for undergraduate and master’s students.

### **Use Technology to Bridge the Distance Between Campuses**

Visiting faculty and students from other campuses can incur substantial burdens in terms of commuting times, a nearly impossible situation with no on-campus parking at the ASRC. To address the important geographic challenges separating ASRC from the CUNY campuses, we are deploying appropriate communication technologies, including teleconferencing and streaming systems, to allow seamless off-campus attendance at seminars and workshops and to enable remote operation of core instrumentation, where safe to do so. The ASRC actively uses CUNY-wide resources (e.g., Dropbox, Sharepoint) and advocates for the deployment of much-needed additions (e.g., eduroam) to facilitate network access and sharing of information across CUNY. Deploying a “one-stop” page on the ASRC website will also provide easy access to materials commonly needed for grant applications (e.g., facilities/instrumentation pages for NIH grants). This is intended to increase the number and quality of ASRC-CUNY faculty grant applications.

# Goal 4: Strategic Partnerships and Outreach



**We will establish the ASRC as a valued source of expert knowledge for businesses, government, and the public in its initiative areas and as a leader in transdisciplinary research. The ASRC will serve as an intellectual magnet for visiting scholars, early career researchers, public sector workforce, and entrepreneurs of the future through its advanced training.**

The ASRC is a unique research center with a complex scientific and educational scope. ASRC and Graduate Center leadership recognize that partnerships with external entities will be critical in advancing the ASRC's mission to carry out leading-edge disciplinary and interdisciplinary research, ensure financial stability, and help build our reputation for innovation and nurturing of talent.

The ASRC has no shortage of opportunities for partnerships and has already engaged in a large number of these. Most of the existing partnerships are driven by individuals or small groups within the ASRC, with some examples of strategic partnering across the initiatives now emerging. During the first five years of operation, many of these partnerships were begun opportunistically, through chance meetings or contact by external parties. Going forward, partnerships should be carefully selected and prioritized, formalized in agreements, and aligned with the ASRC's mission, its competitive advantages, and uniqueness.

The ASRC is currently engaged in dozens of partnerships of various sizes, intensities, levels of maturity, and scope. Some of these activities are funded and formalized; others are ad hoc and informal. The partnerships involve different sectors: industry, academic, and nonprofit/government. They are geographically diverse, including local, national, and international partners. Several modes of interaction are being explored, including shared use of space and equipment, research contracts and collaborations, and internship and fellowship opportunities. ASRC faculty are also involved in a number of larger, multi-partner consortia.

## EXISTING PARTNERSHIPS

### Industry

The ASRC is well positioned to act as an innovation hub for academic-industry partnerships. Existing partnerships include Regeneron, Servier, Ferrero Innovations, BASF, UBS, and 3M as well as several startups. Interactions range from usage of the core facilities to funded research contracts. Several routes have been identified to seek external support to further advance and streamline these opportunities, including the NSF-funded IUCRC (Industry University Cooperative Research Center) planning grant with Columbia and Harvard. We recently received a New York State Center for Advanced Technology grant in the area of sensor technologies, with the specific focus of building academic-industry partnerships. In addition to research and financial advantages, the ASRC can enhance CUNY's STEM education and research curriculum through internships, ensuring our students' seamless transition to the workplace. One example of this is our recent work with the BHEF (Business-Higher Education Fund) for environmental data literacy.

### Academic

ASRC researchers have countless connections and collaborations with academic institutions in New York City, nationally, and worldwide. Academic partnerships are those where multiple beneficial interactions exist that can be leveraged. ASRC faculty engage in a large number of multi-institutional grants, with partners across the CUNY campuses and other universities, national laboratories, and the private sector. Columbia University has been a strong partner to the ASRC because of their proximity and complementarity in research mission. For example, in recognition of the need for access to high-end equipment at both institutions and the desire to maximize complementarity, the ASRC signed a memorandum of understanding with Columbia that provides faculty, researchers, and students with equivalent access to the facilities in both institutions. This partnership presents opportunities for unique education programs, including the NSF Research Experience for Undergraduate grant. As another example, the Neuroscience Initiative partners with the Icahn School of Medicine at Mount Sinai through its Inter-Institutional Center for Glial Biology. The partnership provides access to joint graduate programs open to CUNY and Mount Sinai students and co-sponsored symposia.

### Nonprofit/Government

The Child Mind Institute has embarked on an ambitious mission "to collect imaging and clinical data from 10,000 young people" from all five boroughs of New York City over an initial five-year period. To accomplish such a large-scale project requires coordination and efforts across multiple sites including Weill Cornell Medicine, Rutgers University, and others. To achieve this mission, the Child Mind Institute partners with imaging facilities across New York City, including the ASRC Neuroscience Initiative MRI Facility, which will conduct a significant portion of the data collection from children from upper Manhattan, the Bronx, and Queens.

The ASRC partners with the New York City Economic Development Corporation (NYCEDC) through multiple programs. ASRC faculty are currently serving on the LifeSciNYC Initiative Advisory Council, advising on a \$500 million effort to improve the city's infrastructure for biotech via the development of talent, space, and financial resources. They are also engaged in the FutureWorks program, which supports nanomanufacturing and entrepreneurial activities of manufacturing community through a series of events and networking opportunities. These activities embed the ASRC within the New York City community, increasing access to knowledge and expertise from industry, centers, and other academic environments. They help ASRC faculty shape the landscape and resources for growth of sciences within the city.

## International

The ASRC partners with the University of Strathclyde, which, in 2015, opened a Technology Innovation Center with many similarities to the ASRC in terms of scientific focuses, (including photonics, nanoscience, and smart cities), mission, and scale. CUNY and Strathclyde have both committed finances to this partnership, and we have funded dozens of student and staff exchanges, two workshops, and arrangements for joint supervision of graduate students and internships. Several joint publications have already resulted from this partnership. The ASRC also partners with faculty at École Polytechnique Fédérale de Lausanne (EPFL) in Switzerland for photonics and nanomaterials research projects. This engagement has two funded programs sponsored by DARPA and the U.S. Air Force Office of Scientific Research. As yet another example of such international collaboration, the ASRC has signed a memorandum of understanding with the Institute of Advanced Studies (iASK) in Közseg, Hungary) to exchange students and expertise on plans for ecosystem-based regional revitalization in western Hungary.

## Consortia

ASRC researchers have taken advantage of the center's location in New York City to establish collaborations and consortia with local, state, and regional organizations around significant societal challenges. One example has focused on the environmental challenge involving urban soils within New York City, and their importance for urban agriculture, afforestation projects, and ecosystem restoration. These efforts have involved collaborations with city, state, and federal government organizations together with several CUNY campuses, including Brooklyn College, and non-governmental organizations. This work has involved a number of faculty members, researchers, and students and has already produced several significant publications. In neuroscience, the New York Glia Club— involving Columbia University, Hunter College, New York University, Rockefeller University, Rutgers University, Weill Cornell Medicine, and Yeshiva University— has the goal of sharing science and providing a forum of growth and scientific exchange for trainees and faculty. The ASRC is also involved in an international consortium on water resource issues across the planet, which includes international research organizations such as the International Institute for Applied Systems Analysis (IIASA); non-U.S. universities such as Griffith University and the Australian National University; United Nations organizations such as UNESCO and the U.N. World Water Assessment Programme; and the international Water Future Programme. These groups collaborate through joint meetings and research projects with continued plans for collaboration through memorandums of understanding and research grants.

## Objectives

**To identify new partners from among national and international academic partners, non-governmental organizations (NGOs), governmental agencies, intergovernmental bodies, and the private sector, we will:**

- Develop a more formalized process to identify and secure partnership agreements with the ASRC.
- Implement a mapping and monitoring system to record and track these partnerships and their outcomes.
- Formalize academic-industry partnership opportunities through a funded innovation center(s) (e.g., New York State's Centers for Advanced Technology, National Science Foundation's Industry-University Cooperative Research Centers program) and develop best practices and templates to negotiate legal considerations associated with research and educational efforts that are connected to these partnerships.
- Involve industry, national labs, Department of Defense labs, and other entities in CUNY's STEM education and research curriculum to ensure our students' seamless transition to the workplace. ASRC is well placed to help equip New York City's STEM workforce and educate scientifically minded New Yorkers with an emphasis on underrepresented minorities and women. In particular, the ASRC can help address the issue that while 90% of graduate students in STEM areas pursue nonacademic careers, traditional scientific doctoral training is better suited for careers inside the academy.

## Implementation Plan

An evolving process of expanding and deepening ASRC partnerships across the New York City metropolitan area, the nation, and the world is needed. The appropriate procedures not only will satisfy and streamline a basic administrative need but—if they are cast correctly—will also position the ASRC at the forefront of transdisciplinary research by ensuring a sufficient leadership in and meaningful contributions to many of the partnerships.

### Supporting actions will include:

#### Partnership Vetting

A system and process will help to decide which partnership opportunities are best to pursue, with respect to alignment with the ASRC's overall mission and goals and best use of its limited human and financial resources. Each partnership should have a business plan associated with it, with identified timelines, deliverables, return-on-investment goals, and clear points of exit for all parties involved. This must include clarity on how to share revenue and costs associated with partner institutions. A focus on local, New York City–based opportunities may ultimately reduce the cost and complexity of such partnerships and better align with the ASRC and broader CUNY missions.

#### Tracking ASRC Partnership Activities

With increased and increasingly complex external partnerships, the ASRC will institute a process and establish a database to track and report on partnership activities and outcomes. This systemic approach will also aid in projecting future capacity and needs to support partnerships.

#### Addressing Legal Issues

The complexity of the ASRC's funding from tax-levy sources and the Research Foundation of The City University of New York and its status as a New York State bond–funded project create unique legal opportunities and constraints that should be identified and addressed prior to formalizing partnership agreements. Working closely with legal experts at The Graduate Center, the CUNY Office of the General Counsel, and the Research Foundation, we will streamline and strengthen the process of developing and finalizing these agreements to avoid potential legal difficulties in moving partnerships forward.

#### Nonacademic Career Training

The vast majority of science Ph.D. graduates apply their training in other research or science-related sectors. Doctoral programs do not traditionally provide experience outside of academia, but, through the partnerships the ASRC has made and seeks to establish, there is an opportunity to create paid internship programs and a training pipeline for students who wish to enter industry.

# Goal 5: Financial Resiliency



**We will create opportunities to expand the ASRC’s funding base from traditional grant funding; develop strategies to gain philanthropic and foundation support; and explore innovative working models for university–private sector collaborations, capitalizing on the center’s cutting-edge research facilities and unique workforce training opportunities.**

Financial support for the ASRC comes from multiple sources, including: tax levy funds, capital funds from the Dormitory Authority of the State of New York (DASNY), and external research grants from federal and nonfederal sources, which are administered through the Research Foundation of The City University of New York and provide indirect cost recovery. The ASRC also generates revenue from its core facilities. In its first five years of operation, sponsored program and core facility revenue increased by an average of 60% annually, and the center has been sufficiently funded to meet its needs and to jump-start a successful, world-recognized research program.

## Objectives

**To succeed in the aspirational growth of its scientific and educational programs and maintain its position at the cutting edge of technology, the ASRC must continue to broaden and increase its revenue from multiple sources, including:**

- Federal and nonfederal funding agencies
- Academic, industry, and nonprofit research partnerships
- Philanthropic organizations and donors
- Core facility usage

The expenses related to the interdisciplinary and high-risk research we envision coming from the ASRC and its cross-campus centers of excellence as well as the cost of continuing to equip and maintain the core facilities with state-of-the-art instrumentation will require significant investments unlikely to come from traditional grant mechanisms.

## Implementation Plan

To ensure the ASRC's financial stability during the next five years and beyond, we will pursue three major strategies:

### Target High-Profile, Large-Scale Grant Funding Opportunities

It will be crucial to increase revenues from external research grants by attracting larger funds from a more diverse pool of funding agencies. The discussion earlier of the need to cultivate strategic partnerships is particularly relevant here, that is, to actively seek multi-university, multi-PI, interdisciplinary, large funding opportunities. These opportunities exist through the Department of Defense Multidisciplinary University Research Initiatives, National Institutes of Health, National Science Foundation Engineering Research Centers and Science and Technology Centers, and Defense Advanced Research Projects Agency, which together are likely to provide key support to bolster research revenues above and beyond smaller federal and nonfederal funding mechanisms that will still be pursued by individual investigators. Also of note, the National Science Foundation's funding opportunities for convergence research are also in line with the goals of the ASRC's interdisciplinary approaches.

These large awards will increase the visibility of the ASRC among scientists nationally and internationally. They will also boost indirect cost recovery, which is another important source of revenue for the ASRC to cover some of its facilities and administrative expenses. It should be noted that running such centers successfully requires an extensive and efficient administrative support structure, both during the preparation of proposals and execution of these centers.

### Fundraising

While funding from federal and nonfederal agencies will remain an integral component of the research support for the ASRC, these sources traditionally recognize excellence in specific disciplines, and outside of a few mechanisms, such as the National Research Foundation's convergence research initiatives, it is difficult to obtain funds to spur new high-risk ideas and interdisciplinary concepts.

Fundraising through philanthropy will give ASRC scientists the flexibility to pursue new areas of research, expand their expertise, and attract talent. Philanthropic support can be used to spur innovative preliminary studies and proposals and support students and researchers seeking training in interdisciplinary science. We will hire a development officer focused on philanthropic fundraising efforts that allow ASRC scientists to pursue breakthrough research and address the most challenging questions of our day.

### Expand Core Facility Use and Associated Income Streams

Outreach efforts to enhance the user base of the ASRC's core facilities are needed to reach the goal of covering the major portion of core facility expenses and equipment updates and achieve a financial steady state. The variety of funding streams for core facilities (Research Foundation of CUNY, Graduate Center auxiliary accounts, and tax levy funds) require an improved process for financial tracking and reporting. Clearer financial reporting must be achieved in order to identify a more targeted user base for the core facilities.

Better connections with local industrial and extramural academic scientists will be crucial, and recent efforts to streamline the process of establishing agreements and contracts with external researchers has been helpful.

There are also opportunities for the ASRC to serve the research needs of municipal and state agencies, such as the departments of health, transportation, and environmental protection. In addition, core facilities and their directors should undergo regular reviews to assess progress and establish short- and long-term goals with ASRC leadership. A better connection with the venture capital community in the New York metropolitan area will also be critical. Enhancing ASRC interactions with venture capital funds and private equity firms on issues like technology and intellectual property validation could provide another important and steady source of funding.

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