



A NEW RESEARCH STRATEGIC PLAN

for SUNY Upstate Medical University

THE UPSTATE DISCOVERY CHALLENGE

A NEW RESEARCH STRATEGIC PLAN FOR SUNY UPSTATE MEDICAL UNIVERSITY

On the cover: Preethi Ganapathy, MD/PhD, in her lab.

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INTRODUCTION

It is with great pleasure and pride that I introduce a new Research Strategic Plan for SUNY Upstate Medical University. This new plan was developed by a highly inclusive, interactive and iterative process we call “The Upstate Discovery Challenge.” We challenged our community to discover the future of our research enterprise.



This plan was developed during the time of COVID, but is not a reaction to the conditions of that time, as it seeks to chart an evolvable 5-10 year blueprint to expand our research support structures, capabilities, expertise and research personnel with the overarching goal to accelerate the footprint, impact and reputation of Upstate’s research mission. I mention this to make the

point that the bizarre video-conference world that existed during this time actually made it easier to bring together large numbers of our researchers to collaboratively ideate and create the grist for the mill that is our final document. To memorialize this, we have included a screen shot of one of our many Zoom calls.

RESEARCH MISSION STATEMENT

To create a world-class research enterprise that supports biomedical innovation, development and entrepreneurship improving the health and well-being of the world’s people while training the next generation of scientific innovators.

As you read the plan, you will notice this is not your typical strategic plan with grandiose goals, aspirations and promises of wild growth. Instead, it is a practical plan that focuses on

what we need to change/add/improve to empower our researchers to achieve their full potential. This will drive broad and deep growth, encompassing clinical, basic, translational and educational research, as well as public health and entrepreneurial activities.

Why formulate a new research strategic plan now? Upstate has been on a trajectory of research growth for the past six years as evidenced by the data shown nearby. In all key performance indicators there has been growth including: research expenditures, grant submissions, publications and intellectual property. In expenditures alone, we have grown 35 percent over this time period. This indicates that we are at an important inflection point to accelerated growth. Therefore, we need to be ready to support this growth by ensuring we take full advantage of this opportunity to realize the reputational benefits to the University with a rapidly expanding research enterprise that has global impact.

FAST FACTS

GRANTS SUBMITTED IN THE PAST 5 YEARS	1,351
TOTAL DOLLARS REQUESTED PAST 5 FISCAL YEARS	\$1,196,523,389
CURRENT NUMBER OF ACTIVE CLINICAL TRIALS	546
TOTAL RESEARCH EXPENDITURES PAST 5 FISCAL YEARS	\$167,255,812
CLINICAL TRIAL EXPENDITURES PAST 5 FISCAL YEARS	\$10,883,852

CURRENT NUMBER OF ACTIVE RESEARCH FACULTY:

BASIC AND TRANSLATIONAL RESEARCHERS	95
CLINICAL RESEARCHERS	153
NUMBER OF PATENTS FILED PAST 5 FISCAL YEARS	113

PERCENT FUNDING BY SPONSOR

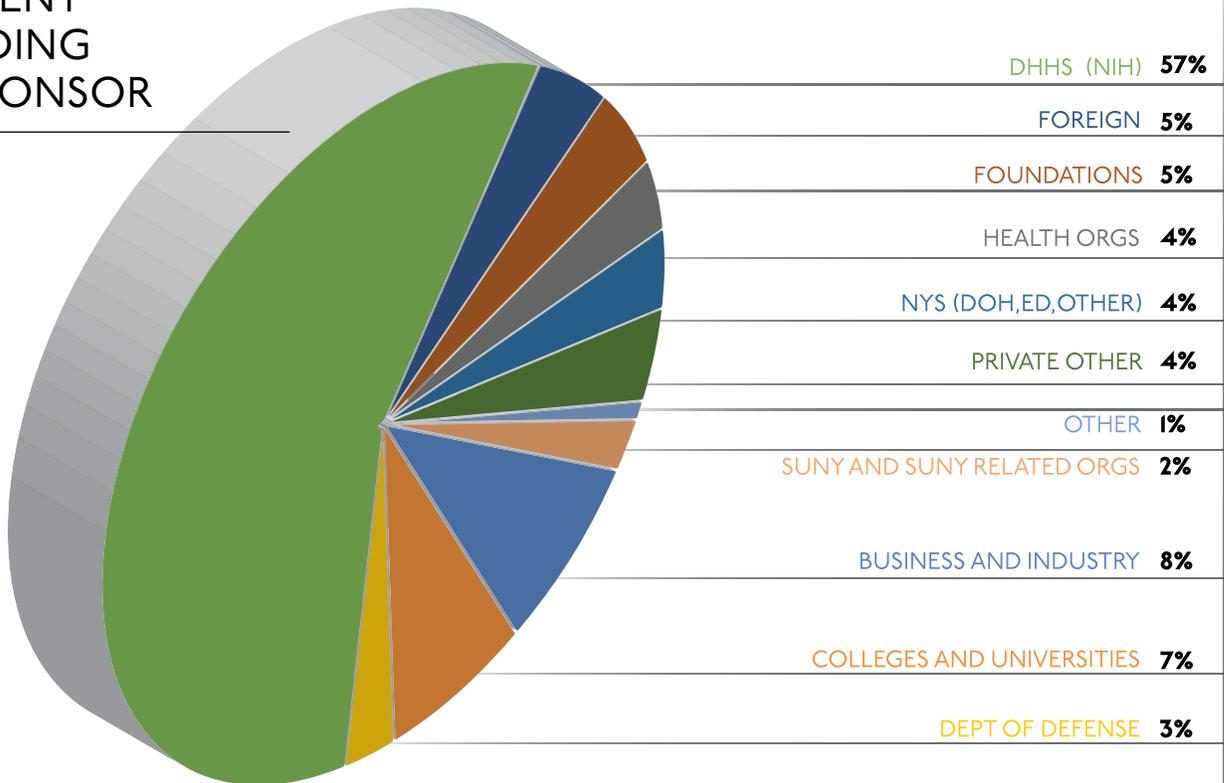


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EXECUTIVE SUMMARY

A New Research Strategic Plan for Upstate Medical University; The Upstate Discovery Challenge

THE PROCESS TO DEVELOP A NEW RESEARCH STRATEGIC PLAN

A highly inclusive and participatory process was employed to develop the ideas that form the basis of this new Research Strategic Plan. We refer to this as a “Discovery Challenge” as it challenges the faculty to work collaboratively to discover the foci and initiatives that will not only advance research capabilities and productivity in their areas of interest, but that will advance the impact and reputation of the University’s research mission as a whole.

The Discovery Challenge process was first designed and implemented at The SUNY College of Environmental Science and Forestry (ESF) by Upstate’s current Vice President for Research (VPR) when he was acting as Interim President at ESF. At ESF, the entire faculty were encouraged to self-organize around cross-cutting initiatives of their design. This worked well at an organization with a strong shared mission of environmental stewardship. However, at an organization of Upstate’s size and diversity, there was a need to provide more structure to guide faculty ideation.

The structure provided was to organize groups of, on average 10 faculty and staff, into eleven “working groups” focused on an area of strength and/or strategic priority. These included:

- Bioinformatics
- Cancer
- Clinical Research
- Educational Research
- Entrepreneurship and Industry Relations
- Environmental Health and Environmental Medicine
- Facilities, Technology and Operations
- Global Health, Infectious Disease and COVID-19
- Immunity and Autoimmunity in Disease
- Mechanisms of Disease
- Neuroscience

Dozens of faculty and staff were involved in formulating the Research Strategic Plan, often meeting online.





Students and faculty work closely in pursuit of new knowledge.

Working group members were chosen by the VPR, in consultation with leadership, but the goal was to include on each group highly functional researchers at all stages of their careers, including early career investigators reflecting the fresh ideas they bring and their strong investment in the future of this institution. With an eye to driving inter-SUNY campus collaboration, working group members included one faculty member from SUNY Oswego on the Bioinformatics Working Group and four faculty from SUNY ESF on the Environmental Health and Environmental Medicine Working Group. Working Group members and group chairs can be seen in Appendix A, "Research Strategic Planning Process."

Each working group was provided with a charge that included a set of deliverables to be addressed in a concise report that was to be delivered approximately a month after the groups began their work. The basic/translational biomedical-research-focused working groups shared a generic charge and deliverables, while some groups required a topic-specific charge, including Clinical Research, Educational Research, Entrepreneurship and Industry Relations, and Facilities, Instrumentation and Operations. The Working Group charges can be seen in Appendix A, "Research Strategic Planning Process".



Multiple layers of containment serve to help keep researchers safe as they expand the boundaries of scientific knowledge.

At the completion of the working groups reports, a “Synthesis Committee” was assembled, chaired by the VPR, that included all of the chairs of the working groups, the Dean of The College of Medicine, senior staff of Research Administration, a representative from Marketing and Communications, and a representative from the Upstate Foundation. Synthesis Committee members can be seen in Appendix A, “Research Strategic Planning Process”. The work of the Synthesis Committee was to meld the ideas, priorities, and mini-strategies from the working group reports into a cohesive and synergistic draft strategic plan. The working group reports can be seen in Appendix D, “Working Group Reports”.

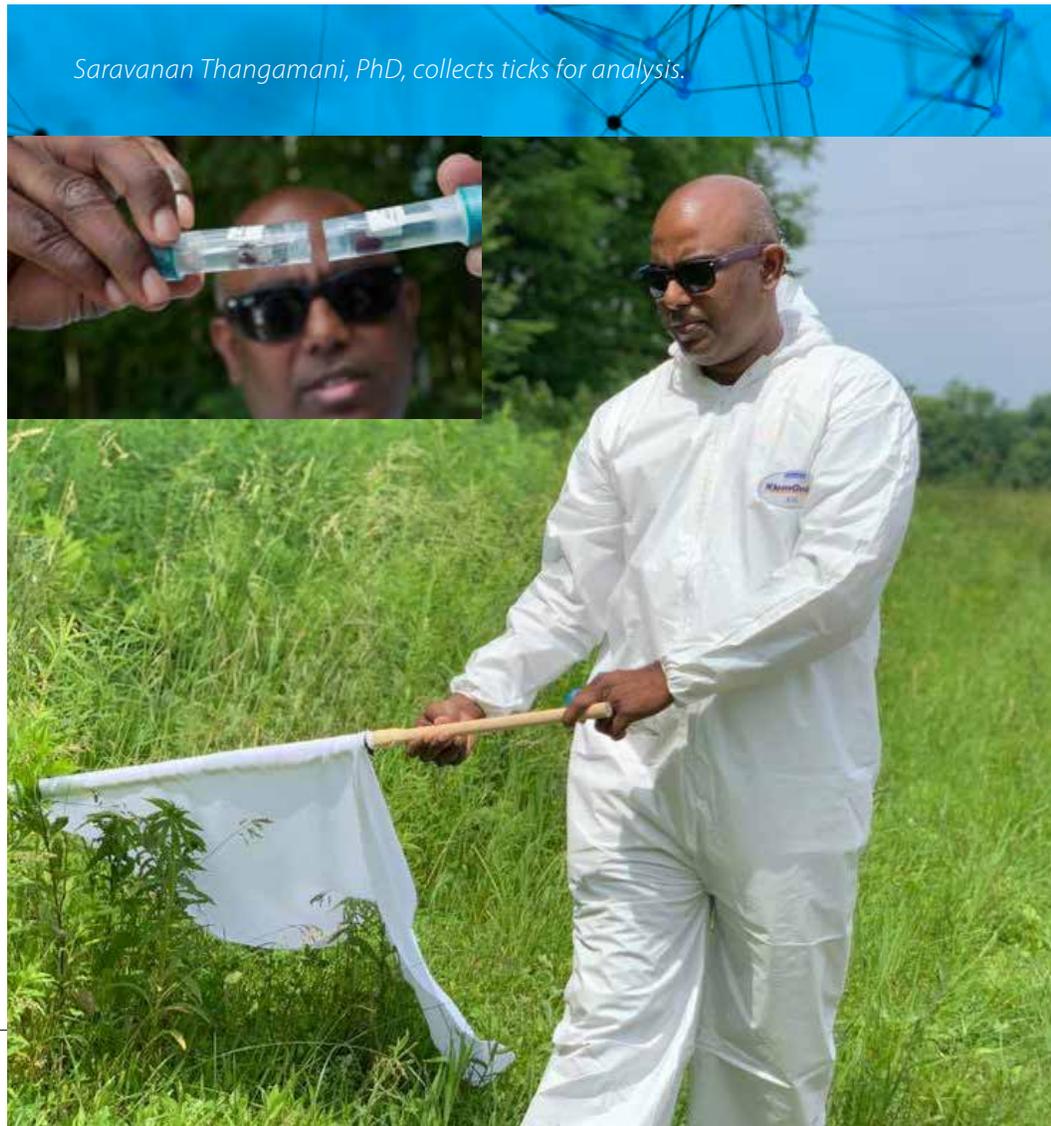
The Synthesis Committee work progressed in two stages. In the first stage, committee members were asked to find cross-cutting initiatives and ideas that were identified by most, if not all, of the working groups. Since these initiatives will have the broadest impacts across the research enterprise, they are the highest priority initiatives in the implementation of the new research strategic plan. These cross-cutting initiatives are summarized in the next section of this Executive Summary and are described in more detail in Appendix B; “Cross-Cutting Initiatives”.

In the second stage, the Synthesis Committee members were asked to extract from each working group report the highest priority faculty hires and high-impact initiatives that are specific to each working group's area of focus. These are briefly discussed in the third section of this Executive Summary and can be found in detail in Appendix C, "Priority Hires and Working Group Specific Impactful Initiatives". This document is intended to guide future faculty hiring decisions and EIP submissions to SUNY Central, to inform the next layers of research strategic plan implementation, to inform institutional and departmental areas for investment, and inform the Office of The VPR on areas to focus efforts and resources.

The last stage of the Upstate Discovery Challenge process is to hold a series of virtual retreats, to which all University members, including students, will be invited to participate. During these sessions we will share and socialize the draft plan; we will attempt to achieve broad buy-in in support of the plan and to collect feedback. After these retreat sessions are completed, we will finalize the new Research Strategic Plan.

CROSS-CUTTING INITIATIVES

One of the unique aspects to the new Research Strategic Plan is that it is not merely inspirational with lofty goals, but seeks to address what holds the faculty back from achieving their full potential. The research enterprise is fundamentally healthy with a 35% growth in research expenditures over the past five years. Some of this success has resulted from increased, focused support of research faculty through investment in new cores, bridge and pilot grants, and targeted hiring of new highly productive faculty, such as Empire Scholars. In addition, we have seen many more faculty with multiple, large federal grants. However, there is the perception that in a number of key areas and capabilities we lag well behind our competitors, and that will continue to present us with reputational, recruiting and retention challenges. In order for Upstate to accelerate the growth of its research enterprise, we must begin to address the major challenges identified by our research faculty. These are issues and





Lab space in the Neuroscience Research Building includes areas for ophthalmologic research.

initiatives identified by many, if not all, of the research strategic plan working groups as cross-cutting initiatives that, if addressed, will have the largest impact across the whole research enterprise. They are briefly summarized in this section and ordered by their perceived level of importance. More detail can be found in Appendix B; “Cross-Cutting Initiatives.”

#1. Establish a research-dedicated information technology core.

Although some progress has been made in providing more support from Information Management Technology for research needs, this was still identified by all research strategic plan working groups as a barrier and deficiency as compared to their needs and what is provided at peer institutions. The needs are diverse and complex including: support for data storage and data sharing, experts in the many facets of bioinformatics including machine learning and artificial intelligence, data sourcing and hygiene, ready availability of institutional data, and data integration with electronic health records. A task force will be required to develop a staged implementation plan for this core. Given the importance of this initiative, the task force should begin work immediately with a plan to begin implementation before the end of 2021.

#2. Develop a positive incentive strategy for research protected time for clinical faculty.

There are currently disincentives for clinical faculty to engage in clinical and translational research which boils down to the absence of compensated protected time for research. This challenge was highlighted by strategic plan working group members from both clinical and basic science departments. It was cited by both sides as a major challenge to develop the kind of collaborative, translational research projects that drive innovations

from “the bench to the bedside” that will distinguish Upstate as a premier academic medical center. This issue is also complex and potentially controversial in our current structure. Therefore, tackling it will require a task force composed of accomplished and well-regarded faculty and staff that will be able to win the support of the clinical chairs.

#3. Develop new core facilities in histopathology and electron microscopy.

Research histopathology has been a challenge at Upstate for some time, leaving faculty to use slow and costly external vendors. The current Chair of Pathology has committed to develop a research histopathology core over the next couple of years and so the solution to this challenge is in sight.



Audrey Bernstein, PhD, in her lab.

Upstate has for several years supported a very high-end cryo-electron microscope obtained with a federal instrumentation grant and housed at ESF. This microscope is well beyond the needs of a large number of faculty at Upstate, who require simple transmission electron microscopy (TEM). This need was recognized by the VPR prior to the completion of this research strategic plan. A new EM core is currently being established, with support from the VPR Office, by repurposing a TEM housed in the Department of Cell and Developmental Biology. We hope this core will be operational within the next four to six months.

#4. Expand the Biobanking Core in capacity and in capability to support data integration.

Approximately three years ago, as a part of the Cancer Center initiative, a new core for biobanking was established with dedicated space, a single technician and equipment. This core has now reached capacity servicing just the needs for banking cancer-specific samples. This has now been identified as a huge need outside of cancer by several of the research strategic plan working groups and there are currently plans to expand the core to support needs in rheumatology; further expansion may be required in particular to meet the extensive needs by well-funded investigators in neuroscience.

Biobanked samples across the spectrum of our research enterprise would be most powerful if they were coupled to electronic health records data and genetic data including genome sequence data. This may require additional investment in the sequencing capabilities of the Molecular Analysis Core (SUNY MAC). There is currently a task force that has been working on these issues and they should continue their work to make recommendations for implementation to leadership. However, data integration with biobanked samples will likely require IT support through a new research-dedicated IT core (cross-cutting initiative #1).

#5. Improve the research institutional profile.

All of the research strategic planning working groups asserted that there needs to be better marketing and communication of the accomplishments and capabilities of the research enterprise to external audiences. In particular, they cited a complete lack of a research focused social media presence and a weak web presence as problematic. Unfortunately, the research mission of Upstate is a well-kept secret and this most negatively impacts the recruiting of talent across the research enterprise including the recruitment of chairs, faculty, post-docs and students. It is recommended that the Office of Marketing and Communications, and The Office of External Affairs meet with research faculty to understand their concerns and to work collaboratively to develop a plan to address those concerns; many institutions of our size have a dedicated person or team to market the research enterprise.

#6. Strengthen the postdoctoral fellows program in numbers and prestige.

Many of our research labs are highly reliant on PhD students as the primary workforce beyond research technicians. However, it takes two to three years for graduate students to become optimally productive. Postdocs, on the other hand, arrive well-trained from day one and as such can be incredible drivers of productivity, innovation and increased competitiveness to obtain new federal grants. Therefore, supporting

an increase in postdocs on campus will have an impact across the research enterprise. Tangible initiatives that would move the needle in this area include: increased marketing to support a postdoc recruiting strategy, better support and encouragement for postdocs to apply for F32 grants with an eye to future institutional postdoc training grants, and better support for career development. Addressing this issue should be a collaborative effort between the Office of the VPR, Office of Post-Doctoral Affairs, and Marketing and Communications.

#7. Develop formal mentoring programs to support the success of our research faculty.

Mentoring of research faculty across the career spectrum, but in particular for junior faculty, needs to be supported at an institutional level. We frequently invest large amounts of resources in recruiting research faculty to campus, but do not follow with the kind of mentoring and support that will ensure success. Some departments and units do this well, while others struggle and thus institutional-level support and guidance is required. The Office of the VPR, working collaboratively with the Senior Associate Dean for Faculty Affairs & Faculty Development, chairs, and center/institute directors, should develop a strategy for faculty mentoring and development.



Dr. Ruth Weinstock

#8. Develop pipeline and development programs to diversify our research work force.

The diversity of our research workforce falls well below our aspirations, and should include a better reflection of the community in which we reside. In addition to making Upstate a welcoming environment for underrepresented minority (URM) learners and faculty, a prime goal of the Office of Diversity and Inclusion (ODI) Task Force, we need to be better at recruiting diverse individuals and retaining them by providing high quality support, mentoring and career development (see above). A strategy proposed by many of the research strategic plan working groups is to develop relationships and pipeline programs with institutions that have diverse populations and then to retain those URM learners and faculty by providing opportunities and high-quality career support. We also plan to submit for a Post-Baccalaureate Research and Education grant from the NIH, a one-year program that supports URM learners to obtain research experience; this program could pipeline into our graduate program. It is also proposed to develop research tracks for medical students and residents.

#9. Create an easily searchable and public, web-based resource of faculty expertise.

There is currently a lack of ability for researchers on campus to identify colleagues with particular experience and expertise for either consultative purposes or to establish collaborative research projects. Funding agencies are asking for multi-disciplinary research proposals that also tend to come with larger budgets, so there is strong incentive for us to encourage collaboration between researchers on campus. An additional benefit of creating this resource is for researchers outside of Upstate to identify potential collaborators but also for industry to identify potential partnerships for intellectual property (IP) development or possible consultative/contract arrangements that would bring additional financial support to our research labs.

INFRASTRUCTURE

Supporting a biomedical research enterprise and its faculty and staff requires a large and highly functioning infrastructure to enable the faculty, in particular, to focus on their research programs, publishing, mentoring students and obtaining grants. For this reason, there was a Research Strategic Planning Working Group specifically focused on Facilities, Technology and Operations.

The Central New York Biotechnology Accelerator.





Learning involves simulation, technology and classroom discussion.

In regards to facilities, this working group focused on the space needs for the research enterprise. They recommended the creation of a research space planning committee and the finalization of a research space allocation policy to create transparency in research space decisions. They were also mindful, that the science-focused working groups recommended additional core facilities and advocated for identifying appropriate space for these cores and/or to look at consolidation of some core facilities. In addition, it was recommended to resume the schedule of research floor renovations in Weiskotten Hall and Weiskotten Addition in anticipation of research growth.

In regards to technology, this working group echoed the calls for robust dedicated IT support for the research enterprise. They also shared with other working groups, the observation that the Clinical Research and Evaluation Core (CRE) that resides in the Department of Public Health and Preventive Medicine (PHPM), will only become more important for the growth of clinical research and, as such, needs to be evaluated for missing expertise and capacity. In conversations with the chair of PHPM and the CRE core director, it was ascertained that the current business model does not work in that much of the important support they provide to faculty, students, and residents is uncompensated. Ideally, the CRE should evolve to a business model that accepts the CRE as an institutionally supported asset that serves both the research enterprise but also the educational missions of all four colleges.

Concerns in operations were also noted and recommendations were made about adequate staffing of the pre-award office. Grant submissions have been rising significantly and the current level of staffing is barely keeping up and completely unable to provide the kinds of highly useful faculty training provided by most pre-award offices. This group also echoed the call from their colleagues in other working groups for a dedicated grant writer in the Research Development Office. Other priorities included data management policies and support, a dedicated office of institutional research, the development of data dashboards for



Upstate trains tomorrow's scientists today.

chairs and principal investigators (PIs), a faculty-development series on our processes and procedures, and in general more efficient and user-friendly support services across the life-cycle of grant awards.

FACULTY HIRING

There is consensus that the SUNY Empire Scholar program is a powerful means to recruit highly functioning research leaders to our campus. It is encouraged that we fill our approved EIP positions: two more in environmental health and medicine (one of the hires is slated for SUNY ESF), two in Alzheimer's, one in addiction science and two in vision research. All fit well within the priorities of the Research Strategic Plan. There is strong indication that SUNY sees the value and ROI of the EIP program and as such there is every reason to believe the program will continue post- pandemic. To ensure alignment of EIP position applications with the Research Strategic Plan, a process and committee should be established to vet and approve the targeted research areas. EIP proposals should be drawn from the priority hiring areas identified by the science-focused working groups. Suggested committee members would include the Dean of the College of Medicine, the Vice President for Research, Dean of the College of Graduate Studies, and appropriate basic science and clinical chairs.

In concert, Upstate should pursue the growth of the research faculty body by replacing retiring and underperforming senior faculty and creating new positions to include the recruitment of outstanding early career faculty to ensure the vibrancy and age diversity of the research faculty. In parallel, a strategy for recruiting underrepresented minority (URM) research faculty needs to be developed and implemented as described in cross-cutting initiative #8.

SHORT SUMMARIES OF THE RESEARCH STRATEGIC PLAN WORKING GROUP REPORTS

BIOINFORMATICS

This group identified the importance to fill a void Upstate has in medical and public health informatics, the opportunity to pipeline from SUNY Oswego to create a PhD program in Biomedical and Health Informatics. Also identified the importance to further develop this area, initiate a seminar series on Bioinformatics and a full graduate-level course in biomedical informatics and data analytics.

CANCER

This group emphasized the need to find a new Cancer Center Director with a strong track record and plans to support cancer research. In addition, Upstate should resume the committed hires in the priority areas of the cancer center, continue to build cancer bioinformatics, and fill a glaring void at Upstate in cancer immunotherapy. A deficiency was identified in cancer public health and health disparities research that will be a pre-requisite for National Cancer Institute (NCI) designation. This team also suggested that a new basic science department in cancer biology should be established, that the Cancer Center Director be the chair of this department which he/she could use as a means to recruit research faculty. To help facilitate bench to bedside drug development, it was suggested to establish a new core facility in pharmacokinetics; this would have a positive impact in many research areas and should be explored further.

Educating researchers is an integral part of our work.



CLINICAL RESEARCH

This group identified a need for an increase in seasoned clinical researchers on campus to serve as mentors and, of course, protected time for both senior and junior clinical researchers, as well as increased support staff for research including research nurses and coordinators. If an aspirational goal is to submit a Clinical and Translational Science Award (CTSA) application, we need to develop our clinical research education and training programs with funded training grants. Increased collaboration in clinical research with our partners in the Syracuse VA was identified as a great opportunity. Additional recommendations: Implement more of the research functionalities of EPIC and solve the issues around contacting our patients to be on clinical research studies; address disparate demographics of research subjects; develop a Clinical Research Coordinator (CRC) certificate program to address the shortage of well-trained CRCs; a sub-committee on the Clinical Research Unit (CRU) suggested expanding the CRU and developing more satellite sites near the sites of patient care, for example The Nappi Longevity Institute.

EDUCATION RESEARCH

This group identified a need for supporting staff and faculty interested in educational research to address the challenges around obtaining and analyzing institutional data. Also highlighted was the impact of educational initiatives on patient care, as were ways to incentivize, reward and support educational research. Particularly impactful would be developing a Center for Educational Innovation and Excellence that would house a number of capabilities, including the IDEA lab.

ENTREPRENEURSHIP AND INDUSTRY RELATIONS

Priority initiatives to advance our footprint in this area included: increase entrepreneurial postdocs on campus (which dovetails nicely with cross-cutting initiative #6), raise the branding awareness of Upstate's entrepreneurial activities (which fits well with cross-cutting initiative #5), incentivize innovation and industry engagement, streamline transactions with industry partners, invest in service-oriented resources and events, develop mechanisms to match industry partners with faculty expertise (which fits well with cross-cutting initiative #9), and use IP revenue to support pilot grants for early-stage technology development.

ENVIRONMENTAL HEALTH AND MEDICINE

The opportunity to drive collaboration between Upstate and ESF was highlighted as a tremendous opportunity. A possible bridge could be to focus on the impact of environmental degradation on health disparities, which

Amit Dhamoon, MD/PhD, Division Chief of General Internal Medicine, in his lab.





Harry Taylor, PhD, in his lab.

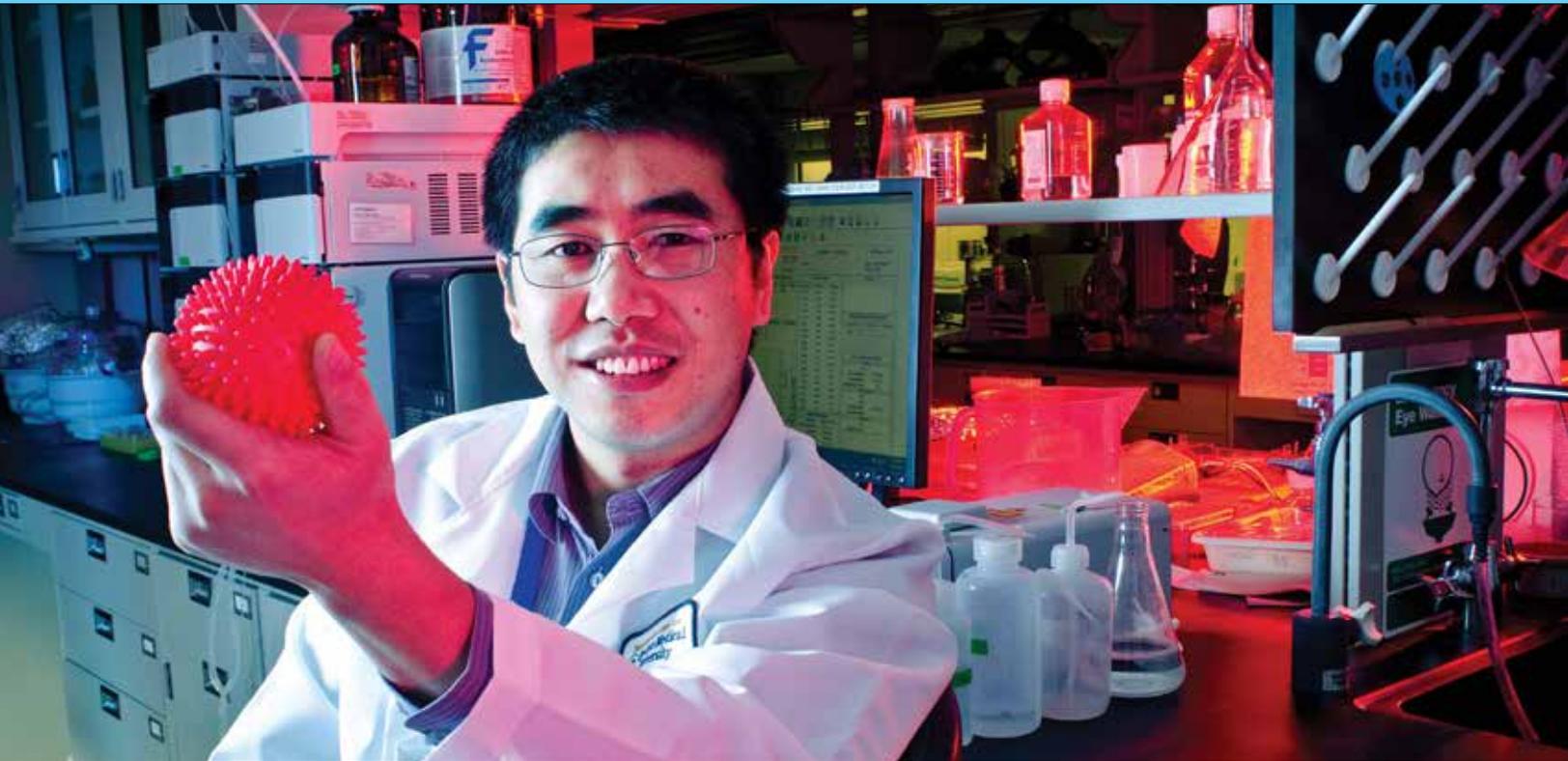
would complement the priorities of several working groups. Developing geospatial analytics would also bridge the two universities. Other initiatives include developing a well-funded Center of Excellence in Vector Borne Disease, a SUNY-supported summit on environmental health and medicine, submitting pre-and postdoctoral training grants in this area, developing collaborative grant proposals between PIs at ESF and Upstate, and expanding the tick surveillance program through external funding.

GLOBAL HEALTH AND INFECTIOUS DISEASE

The need was identified to not only increase depth in this area, but the breadth beyond the current focus in infectious disease. Central New York's refugee population was cited as an opportunity to bridge global health issues. There is a need to break down silos to develop a broad population health program that crosses service lines and create multi-disciplinary teams organized around chronic disease states. Efforts to pursue a center in research and education in bioproduction/biomanufacturing should be reinvigorated. The current poor state of relations with the County Department of Health was cited as a missed opportunity and barrier to progress. Additional initiatives included: increased clinical research space that aligns with the priorities of the clinical research working group, a global health pathway for residents, seed and travel grants for global health research, and submitting more multi-PI/multi-disciplinary grants to increase our ultimate competitiveness for a CTSA application.

IMMUNITY AND AUTO-IMMUNITY IN DISEASE

This group pointed out that virtually all chronic disease has as a critical component of an immune response, such as inflammation or a mis-regulation of the immune system. As such, priority faculty hires in this area overlap strongly with the priorities of other working groups and should be joint appointments with other departments,



Juntao Luo, PhD, in his lab.

creating further opportunities for collaboration. Hiring areas of interest include: genetics and biomarker development, cancer immunology/regulatory T-cells, neuroimmunology in CNS disease, and hires in radiology that support imaging and pathology of disease. Pathobiology was identified as a high-impact area for a new department or center, and for the development of a new graduate-level course. This would drive collaboration and fill an important, missing set of capabilities. Continued institutional support of the Lupus, Autoimmunity, Inflammation and Immune Health Center of Excellence (LACE) was recommended with an expansion in scope focused on immune-mediated diseases. This group, like many others, identified the weakness of not being able to contact and leverage our large patient pool for research studies. Solving this problem would have the added benefit of allowing us to diversify participants in clinical trials. Lastly, and also overlapping with other groups, would be to have high-resolution research MRIs for human and animal studies.

MECHANISMS OF DISEASE

This group emphasized the drug development pipeline focusing on faculty hires to expand structure-based drug design and high-throughput screening, basic research faculty in proteostasis as it applies to Alzheimer's and neurodegenerative diseases, and more clinical faculty with 100% protected time for research to help drive translational collaborations with basic science faculty. All these areas overlap strongly with the priorities of several other groups. This team also sees great potential in increased communication across the enterprise with topic-focused journal clubs, joint meetings, and research presentations at Grand Rounds. Overlapping strongly with Cancer, they propose a program or center that spans the lifecycle of drug development. An Assistant Vice President of Translational Research was proposed with the responsibility of facilitating collaboration with clinical investigators. This could also be achieved through coordination of research liaisons proposed in each



Christine King, PhD, in her lab.

department. In agreement with all other groups, mentoring programs and facilitating more training grants were identified as priorities. Lastly, a distinguished seminar series, jointly sponsored by basic science and clinical departments, and supported by the Office of the VPR, was proposed.

NEUROSCIENCE

Neuroscience was a priority in the last research strategic plan with the opening of the Neuroscience Research Building (NRB), and as a result it has grown to be one of Upstate's strongest research areas. There is tremendous opportunity in bringing together in the NRB the groups and departments doing neuroscience research and much progress has recently been made in unifying the diversity of neuroscience researchers at Upstate. The future recruitment of a long-term chair for the Department of Neuroscience and Physiology is viewed as a critical component of the planned growth and integration of this research

community. The chair will need a revitalization package for the department including faculty lines. A number of other hiring areas were prioritized including: Alzheimer's, neuro-oncology, advanced retinal imaging, neuro-virology, cell and molecular neuroscience, electrophysiology, systems neuroscience, bioinformatics, neuro-trauma, drug screening and development, iPSC-based diseased models, and regenerative medicine. Several of these proposed hires overlap with the priorities of other working groups. Multiple ones are supported by approved EIP positions awaiting permission for recruitment and will be pursued jointly fostering inter-departmental ties. Priority initiatives included further development of the behavioral core, opportunities for increased communication to drive collaboration, a pilot grant mechanism, cross-departmental interest groups to develop large multi-PI grant proposals, and the development of advanced technical capabilities in regenerative medicine, advanced ocular imaging, and AI-augmented research.

IMPLEMENTATION; MAKING THE RESEARCH STRATEGIC PLAN A LIVING AND EVOLVING PROCESS

One criticism often lobbed at strategic plans is that they are a snapshot in time that sits on a shelf and is never implemented. To prevent this from happening to this new Research Strategic Plan, we have to make this not merely a document, but a living process that has the opportunity to evolve. The Discovery Challenge process used to develop this document was an inclusive and highly interactive process and that approach should be encouraged to continue. The Office of the VPR is committed to reconvening all of the working groups on an annual basis to evaluate progress, lack of progress, establish the new priorities for the coming year for implementation, identify new areas of focus and to develop a report that documents progress toward the goals and initiatives of the research strategic plan. Having such a process will facilitate the continuation of broad buy-in to the goals of the plan, allow for the plan to change/evolve over time, and to hold the entire research community accountable for progress in a transparent process.

APPENDIX A:

THE RESEARCH STRATEGIC PLANNING PROCESS; RE-IMAGINING THE RESEARCH MISSION THROUGH THE UPSTATE DISCOVERY CHALLENGE

It has been 12 years since the development of the last strategic plan for research at Upstate Medical University and since then we have seen strong growth, both in the numbers of faculty with research programs, but also in the size of our portfolio and expenditures. In addition, new areas of strength have emerged with the recruitment of additional faculty with diverse interests and expertise. Therefore, it is time to assess our current state and map out a strategy to propel us forward for accelerated growth, greater impact, and increased reputation.

The process by which we will develop a new research strategic plan is designed to be inclusive and from the bottom up, with broad faculty input through focused working groups that will bring their ideas and priorities up to a synthesis committee that will meld the ideas, priorities, and mini- strategies into a cohesive and synergistic, strategic plan. Each of the Chairs of the Working Groups, will serve on the Synthesis Committee. The straw-man strategic plan, will be shared with the community in advance of a research retreat during which further input and ideation will be broadened to inform the crafting of the final research strategic plan.

The Working Groups are as follows:

- Bioinformatics
- Cancer
- Clinical Research, sub-committee on the Clinical Research Unit (CRU) and future CTSA application
- Education Research
- Entrepreneurship and Industry Relations
- Environmental Health and Environmental Medicine
- Facilities, Instrumentation, and Operations
- Global Health, Infectious Disease, and COVID-19
- Immunity and Auto-Immunity in Disease
- Mechanisms of Disease
- Neuroscience

The members of each working group have been chosen carefully to have deep expertise and familiarity in the indicated areas of strength so that we may proceed nimbly and efficiently to derive a new research strategic plan in as short a time frame as is reasonable.

Timeline: The President asks that the working groups produce their reports a month after they are charged by the VPR. The synthesis committee is charged to produce the straw man research strategic plan a month following receipt of the working group reports. The Research Strategic Planning Retreat will be scheduled two weeks after the release of the straw man plan.

GENERIC WORKING GROUP CHARGE

The work product (Report) of each working group will be a concise document that will contain several common prescribed elements with some customization for topics with unique characteristics (e.g., Clinical Research and Facilities, Technology and Operations). The overarching goal is to create a culture, environment and support structure that empowers our faculty and students to achieve at their highest potential. The focus should not be only on how to amplify our strengths, but to identify missing expertise and capabilities that will broaden our expertise and to identify areas of investment that will create bridges between our pillars of strength with the goal of being able to be competitive for larger, multidisciplinary, multi-PI grants.

The elements of the working group report on a focus area should include the following:

- A concise narrative describing current strengths and capabilities.
- A list of technical capabilities, both through personnel expertise and specialized instrumentation.
- Analyze funding trends over the last five years (data will be provided) and extrapolate to characterize the opportunity space around future funding trends.
- Descriptions of new faculty hires that would:
 - o Amplify impact in your area
 - o Fill missing expertise
 - o Create bridges to other areas of strength at Upstate
- Descriptions of new instrumentation and core expertise that would further empower current and future faculty for success.
- A draft strategy to engage, mentor and build collaborations with clinician scientists in your area in order to increase Upstate's translational research portfolio.
- A draft strategy to engage, mentor and build collaborations with early career faculty, fellows, residents and students.
- A draft strategy to address health equity research as part of the portfolio in the focus area. One work group member will be designated as the responsible party for developing this strategy. Chief Diversity Officer Dr. Daryll Dykes is willing to serve as a resource to assist with this plan.

- Describe five aspirational goals in your area that could be achieved in the next 5-10 years. These could include center grants, program project grants, large instrumentation grants, training grants, national/international recognitions, Howard Hughes Investigator etc.
- Any additional initiatives and approaches that would move the needle in your area.

CHARGE SPECIFIC TO THE WORKING GROUP ON CLINICAL RESEARCH AND THE CLINICAL RESEARCH UNIT (CRU)

The overarching goal is to create a culture, environment, and support structure that empowers our clinicians to engage in high quality, externally funded, clinical research projects that stand to improve health care across a spectrum of human conditions.

The elements of this working group's report should include the following:

- A concise narrative describing current strengths and capabilities.
- A list of technical capabilities, both through personnel expertise and specialized instrumentation and facilities.
- Analyze funding trends over the last five years (data will be provided) and extrapolate to characterize the opportunity space around future funding trends.
- A concise narrative on impediments for clinicians to engage in clinical research.
- Develop a strategy to incentivize participation of Upstate faculty in clinical research and to incentivize chairs to encourage participation of their faculty in clinical research.
- Develop a strategy to mentor young clinical faculty, fellows, residents and students in clinical research.
- A draft strategy to address health equity research as part of the portfolio in the focus area. One work group member will be designated as the responsible party for developing this strategy. Chief Diversity Officer Dr. Daryll Dykes is willing to serve as a resource to assist with this plan.
- Develop a plan to increase the number of well-trained clinical research coordinators in Central New York.
- Describe strategies to better engage and enroll Upstate's patient populations in clinical research studies.
- Identify missing capabilities, facilities, instrumentation, and tools such as software and databases that would help drive more success in the clinical research arena.
- Describe five aspirational goals in your area that could be achieved in the next 5-10 years. These could include center grants, program project grants, large instrumentation grants, training grants, national/international recognitions, Howard Hughes Investigator, CTSA application etc.

SUB-COMMITTEE ON THE FUTURE FOCUS AND CAPABILITIES OF THE CLINICAL RESEARCH UNIT

The challenge to this sub-committee is to think of the CRU as the seed from which to grow capabilities, in a phased approach, to make Upstate competitive for a CTSA application in a 5-10-year window. Further, to make recommendations on how the CRU can be a critical asset to a broader and larger number of clinician scientists with the goal of the CRU being a key asset in a larger plan to increase clinical research expenditures. The elements of this sub-committee's report should include the following:

- Detailed data on the costs and revenue currently associated with the operations of the CRU.
- Data on utilization of CRU services by PIs and departments and percent utilization of all CRU human assets (nurses, CRC's, NP).
- A narrative on why some PI's prefer to use the CRU while others prefer to perform their trials at ambulatory centers, and a strategy for making use of the CRU more attractive to clinical researchers.
- Develop a phased plan for increasing the footprint and capacity of the CRU including the possibility of augmenting capabilities to support in patient research studies.
- Describe aspirational goals for the CRU and a timeline to achieve those goals.

CHARGE SPECIFIC TO THE WORKING GROUP ON EDUCATION RESEARCH

The work product (Report) of the Education Research working group will be a concise document that will contain several prescribed elements aimed at increasing the portfolio and impact of research on pedagogies and assessments across our educational activities. The overarching goal is to create a culture, environment, and support structure that empowers our faculty and students to achieve at their highest potential. The focus should not be only on how to amplify our strengths but to identify missing expertise and capabilities that will broaden our expertise and to identify areas of investment that will create bridges between our strengths with the goals of enhancing the scholarship of our educators and being able to be competitive for educational grants.

The elements of the working group report on a focus area should include the following:

- A concise narrative describing current strengths and capabilities.
- A concise aspirational narrative based on Boyer's model of scholarship that describes the vision for educational research at Upstate.
- A list of technical capabilities through personnel expertise and specialized resources or cores/facilities.

- Analyze funding trends over the last 5 years (data will be provided) and extrapolate to characterize the opportunity space around future funding trends.
- Descriptions of new faculty or staff hires that would:
 - Amplify impact in your area
 - Fill missing expertise
 - Create bridges to other areas of strength at Upstate
- Descriptions of new capabilities and core expertise that would further empower current and future faculty for success.
- A draft strategy to engage, mentor and build collaborations with clinician educators to help translate education research findings into education practice.
- A draft strategy to engage, mentor and build collaborations with early career faculty, fellows, residents and students.
- A draft strategy to address research in social justice or structural racism as part of the portfolio in the focus area. One work group member will be designated as the responsible party for developing this strategy. Chief Diversity Officer Dr. Daryll Dykes is willing to serve as a resource to assist with this plan.
- Describe five aspirational goals in your area that could be achieved in the next 5-10 years. These could include numbers and quality of publications and presentations, education grants, training grants, national/international recognitions etc.
- Any additional initiatives and approaches that would move the needle in your area.

CHARGE SPECIFIC TO THE WORKING GROUP ON ENTREPRENEURSHIP AND INDUSTRY RELATIONS

Traditionally, Upstate's IP portfolio and engagement with companies that drive early innovation to the market has been low. However, it represents a promising option for funding research outside the traditional federal funding model. We now know from first-hand knowledge, in working with Start-Up NY company Quadrant Biosciences, that a strong industry partner is critical to bring our faculty's innovations to the market. Furthermore, the revenue potential both to support faculty research, the growth of research operations and the research portfolio of the University can be very promising. This working group's main tasks are to identify the breadth of our industry relations, how to deepen those relationships and form new impactful relationships. In addition, we ask the task force to identify mechanisms and strategies to engage more of our faculty in entrepreneurship and developing relationships with industry partners. Throughout, this working group should think about how to leverage the CNYBAC to achieve the proposed goals.

The elements of this working group's report should include the following:

- A survey of current industry relationships and the stage/extent of those relationships. Include a strategy for deepening each relationship by moving the relationship up the gradient of involvement.
- A strategy to engage new industry sponsors of research, both clinical and early stage innovations with identified faculty leads to pioneer the relationship.
- Identify barriers at Upstate to moving early stage innovation toward the market with proposed solutions.
- Develop a program/strategy to increase faculty, postdoc and student interest and involvement in IP development and entrepreneurship.
- Describe five aspirational goals in this area that could be achieved in the next 5-10 years.

CHARGE SPECIFIC TO THE WORKING GROUP ON FACILITIES, TECHNOLOGY AND OPERATIONS

The success of our researchers is greatly impacted by the quality and functionality of our facilities, access to state-of-the-art technology/instrumentation and efficient operations that minimize “shadow work,” allowing our faculty and their staff to focus on their research, writing papers and grants. To a large extent, our ability to execute on a new and impactful research strategic plan will depend on the forward thinking of this working group. Therefore, the main goal of this working group is to produce a phased plan to be able support growth in the target areas of the other working groups focusing on our facilities (labs and cores), technology and instrumentation, and operating procedures and administrative support structures. The elements of this committee's report should include the following:

FACILITIES

- Assess space utilization by grant dollars but also by utilization frequency in order to determine our capacity for growth.
- Identify and prioritize space to be remodeled to support growth in the target areas.
- In a 10-year window, determine whether we will need to plan for new research construction and/or re-commissioning and remodeling of space currently not dedicated to the research mission.
- Develop a transparent process for guiding space allocation decisions keyed to grant support and the nature of the work, for example dry versus wet bench work and whether work can be performed off-site.
- Examine current core facilities to determine if improvements need to be anticipated to support growth and the adoption of new technology and instrumentation.

TECHNOLOGY

- Provide a catalogue of technologies currently available at Upstate both in cores and departments, an estimate of utilization and whether the instrumentation supporting that technology is outdated and needs to be updated or outdated and no longer useful. If space is dedicated to a technology that is no longer needed, consider this in your space inventory.
- Assess the needs of researchers to access networked equipment when away from lab, especially the needs and capacity of cloud-based storage of data and ensuring privacy of data on restricted server.
- By interfacing with the other working groups, develop a prioritized “wish list” of new technologies that Upstate should consider acquiring that would enhance the capabilities and competitiveness of our researchers in the target areas. Identify the space needs for that technology (natural home) and teams of faculty to spearhead the drafting of instrumentation grants to support the new technology acquisition.

OPERATIONS

- Provide process maps for the processes and procedures that researcher have to engage in to support their work including:
 - o Pre-Award: grant development and submission, contract development and approval, clinical trial agreements development and approval.
 - o Post-Award: Award establishment, RF and state purchasing, reimbursement, travel authorization and reimbursement.
- For all process maps, determine whether there are unnecessary steps that are burdensome both to researchers and administration and areas where more background work could be performed administratively rather than by faculty. Develop new process maps if such inefficiencies are identified.
- Determine areas where time consuming bottlenecks are creating delays, the causes of the bottlenecks with solutions, and whether additional administrative staff is required to break the bottlenecks.
- Identify any potential areas of risk that are currently not being adequately addressed and a plan to mitigate those risks

WORKING GROUP COMPOSITIONS SYNTHESIS COMMITTEE

David Amberg — Chair

Larry Chin, Katie Keough, Mark Schmitt MaryLou Watson,

Task Force Chairs, Leah Caldwell, Eileen Pezzi

Amy Green — admin support

WORKING GROUP ON BIOINFORMATICS

Chunyu Liu — Chair

Isabelle Bichindaritz, Scott Elia, Steve Faraone, Wenyi Feng, Vladimer Kuznetsov,
Frank Middleton, Thomas Schulze*

WORKING GROUP ON CLINICAL RESEARCH/ SUB-COMMITTEE ON RE-IMAGINING THE CRU

Gennady Bratslavsky — Chair

Chris Fortner, George Fulk, Stephen Graziano, Karen Klingman*, Kris Paolino, MaryLou Watson,
Ruth Weinstock, Eufrosina Young

Sub-group on a Future Model for the CRU

Ruth Weinstock — Chair Kris Paolino

Mary Lou Watson, Eufrosina Young

WORKING GROUP ON CANCER

Mehdi Mollapour — Chair

Teresa Gentile*, Jessica Henty-Ridilla, Christine King, Les Kotula, Stewart Loh, Megan Oest,
Chris Turner, Mariano Viapiano

WORKING GROUP ON EDUCATION RESEARCH

Lauren Germain — Chair

Amy Caruso-Brown*, Tammy Austin-Ketch, Lynn Cleary, Rachel Fabi, Rebecca Greenblatt, Stephen Knohl
Andreas Meier, Eric Olson, Bruce Searles, John Norcini

WORKING GROUP ON ENTREPRENEURSHIP AND INDUSTRY RELATIONS

Kathi Durdon — Chair

Steve Hanes, Bill Kerr, Juntao Luo, Kelsey Moody, Matt Mroz, Chris Neville, Eric Smith, Rich Uhlig

WORKING GROUP ON ENVIRONMENTAL HEALTH AND ENVIRONMENTAL MEDICINE

Saravanan Thangamani — Chair

Mary Collins, Margaret Formica, Hyatt Green, Brian Leydet, Lee Newman, Chris Morley*, Telisa Stewart

WORKING GROUP ON FACILITIES, TECHNOLOGY AND OPERATIONS

Frank Middleton — Chair

Wendi Ackerman, Ebbing DeJong, Marylin Galimi, Katie Keough, Matt Mahoney, Gina McMahon,
Dave Kiemle, Bob Quinn, Jennifer Rudes, Grace VanNortwick

WORKING GROUP ON GLOBAL HEALTH, INFECTIOUS DISEASE, PUBLIC HEALTH AND COVID-19

Stephen Thomas — Chair

Katie Anderson, Elizabeth Asiago-Reddy, Joe Domochoowski, Tim Endy, Margaret Formica,
Chris Morley*, Harry Taylor, Saravanan Thangamani, Paula Trief

WORKING GROUP ON IMMUNITY, AUTO-IMMUNITY AND DISEASE

Paul Massa — Chair

Iwona Koenig, Mobin Karimi, Gary Nieman, Andras Perl, Guirong Wang, Cyndi Weickert*, Gary Winslow

WORKING GROUP ON MECHANISMS OF DISEASE

Patty Kane — Chair

Jeff Amack, Audrey Bernstein*, Dimitra Bourboulia, Peter Calvert, Xin Jie Chen, Michael Cosgrove,
David Auerbach, Mira Krendel, Richard Wojcikiewicz

WORKING GROUP ON NEUROSCIENCE

Francesca Pignoni — Chair

Karen Albright, Sharon Brangman*, Bill Brunken, Steve Faraone, Preethi Ganapathy,
Huaiyu Hu, Eric Olson, Dan Tso, Wei-Dong, Yao Li-Ru Zhao

*This Working Group member served as the primary person responsible for a draft strategy to address health equity and diversity.

APPENDIX B:

CROSS-CUTTING HIGH IMPACT INITIATIVES

These initiatives were identified by the research strategic planning working groups as Upstate weaknesses and capabilities, that if developed or enhanced, would have strong positive impacts across the research enterprise. Therefore, these should be the highest priorities for investment and development in the next five years with the highest returns on investment.

#1. Establish a dedicated information technology support core that can meet the growing data, computational and data analytics needs of the research enterprise. This core should jointly report to the CIO and VPR. This includes support for capabilities to perform state-of-the-art Biomedical and Health Informatics research. This was identified as a priority initiative by the Bioinformatics, Cancer, Clinical, Immunity, Mechanisms of Disease, Education and Neuroscience working groups.

- Supporting initiatives:
 - o Solve the data sharing and access issues that result from not being firewalled from the hospital, create campus security levels that are less inhibiting.
 - o Support cloud and local data storage including an academic data warehouse that supports education research.
 - o Core should include data scientists and as well as biostats experts to expand the capabilities of the Center of Research and Evaluation (CRE).
 - o Expertise in machine learning and AI support.
 - o Expertise in data sourcing, hygiene and analysis for to support Education research.
 - o Ability to support data integration for the Biobank e.g., de-identified EHR data.
 - o Support for Image analysis.
 - o Expand collaboration with the Biomedical informatics labs at Oswego's Downtown campus.
- Next Steps: A task force to map out and prioritize how we build this over time.

#2. Develop a positive incentive strategy to provide protected time for clinical researchers, identified by all groups as a priority. This would impact all clinical departments but also the basic science departments by creating opportunities for collaborative translational research between basic and clinical researchers.

- Develop a model for supporting compensation for research time.
- Address the cultural issue of negative incentives for engaging in clinical research.
- Recruit more clinical faculty with strong research experience and interest to serve as mentors, positive examples and facilitators of collaborative translational research.

- Establish strong tenure and promotion criteria for clinical faculty that values research productivity.
- Develop research liaisons for clinical and basic science departments that can work, as a group, to develop collaborative translational research initiatives.

#3. Establish Histopathology and Electron Microscopy (EM) Cores. Identified by the Bioinformatics, Cancer, Immunity, Mechanisms of Disease, and Neuroscience working groups as a priority.

- Supporting initiatives in process:
 - o Chair of Pathology, Dr. Michel Nasr's plans for developing a histopathology core that supports the diverse needs of research faculty.
 - o Establishment of a preferred vendor status for Histowiz to meet histopathology needs while Dr. Nasr builds his core.
 - o EM core is in the process of being established by the office of the VPR.
- Next Steps-Research community should continue to advocate for and consult with Dr. Nasr for the development of an in-house histopathology core.

#4. Continue to expand the Biobank including coupling banked samples to de-identified genome sequence and EHR data. Identified as a priority by the Bioinformatics, Cancer, Clinical, Immunity, Mechanisms of Disease, and Neuroscience working groups.

- Supporting initiatives
 - o The Cancer Biobank administered by Dawn Post should be expanded as an institutional biobank, including to support Dr. Andras Perl's needs.
 - o Expanded whole genome sequencing instrumentation in the SUNYMAC.
 - o Acquire Biobank software that will facilitate data integration of genome sequence and HER data.
 - o Glioma Biobank of Neurosurgery and Dr. Mariano Viapiano.
 - o Couple education data to EHR data to be able to measure the patient outcomes of educational interventions, programs and training provided to health care workers.
- Next steps: coupling biobank and genome sequencing data to the EHR is a very heavy lift and will require the parallel development of the research-dedicated IT team. The current working group for this should continue to meet as a task force to develop an implementation strategy. The current group includes: Thomas Schulze, Vladimir Kuznetsov, Chunyu Liu, Sam Carello, Gennady Bratslavsky, Mary Lou Watson, Sharon Brangman, Scott Elia, Matt Elkins, Steve Faraone, Patricia Forken, Steve Glatt, Mary Ann Gross, Frank Middleton, Andras Perl, Dawn Post, Mark Schmitt. This task force should also investigate whether a partnership with the SUNY Buffalo Bioinformatics and Health Informatics teams may be a viable mechanism to build this capacity.

#5. Improve the research institutional profile to facilitate recruitment of research faculty, post-docs, students and staff. There needs to be better advertising and branding of the research mission including the web and social media presence. This was identified as a deficiency by all working groups. In many institutions, there are dedicated people in The Office of Research that supports research communications, the website, social media for research and research events.

- Short of a dedicated person in RA, a team will need to work with public relations (Darryl Geddes) and marketing and communications (Leah Caldwell) to develop and support a social media strategy to promote research success and to promote and increase the profile of research events sponsored by Upstate.

#6. Strengthen the Postdoc Program in numbers and quality as recommended by all working groups. This will positively impact all research units on campus.

- Improve and expand our postdoc recruiting efforts/strategies.
 - o Collaborative effort between the VPR, Dean of COGS and marketing and communications.
- Support our existing postdocs in obtaining more F32 grants. This will be required for us be competitive to apply for T32 postdoc training grants, an aspirational goal of several working groups.

Collaborative effort between the VPR and Dean of COGS

- Establish a mandatory career development and mentoring program for postdocs including the development of a required postdoc Professional Development Plan template.
 - o Initiative internal to COGS with support provided by the office of the VPR as needed.

#7. Develop formal mentoring programs to develop and support the success of our human capital.

- For Basic Science Assistant Professors.
 - o VPR Office should work with the Senior Associate Dean for Faculty Affairs & Faculty Development, Basic Science Chairs, Center and Institute Directors to develop a strategy/plan.
- For Clinical Assistant Professors.
 - o VPR Office should work with the Senior Associate Dean for Faculty Affairs & Faculty Development, Clinical Chairs, Center and Institute Directors to develop a strategy/plan.

#8. Develop pipeline and development programs in part to increase the diversity of our research faculty and research work-force.

- Supporting initiatives
 - o Establish URM pipelines/articulation agreements with high schools, Universities, and programs (such as On Point for College) that have and support diverse student bodies.

- Collaborative effort between the Dean of COGS, VPR and Student Affairs.
 - o Submit and obtain a Post-Baccalaureate Research and Education (PREP) grant from the NIH.
- Will require a one-year self-funded pilot that is currently being worked on by the VPR and Dean of COGS.
 - o Develop a Master's degree in research option for medical students that would add an extra year to their program and a pathway to obtain the dual MD/PhD degrees.
- Collaborative effort between the Dean of COM, Vice President for Academic Affairs, The Director of the Office of Research for Medical Students, and VPR.
 - o Develop a Master's degree or certificate in research for residents that would require an additional year in their residency programs to provide for a meaningful research experience.
- Collaborative effort between Clinical Chairs, Resident Program Directors, GME Director, the Assistant Dean for Graduate Medical Education Research, VPR and Director of Clinical Research Initiatives.
 - o Submit and obtain funding to support diversity at all levels including: NIH's Bridges to the Doctorate Research Training Program (T32), Faculty Institutional Recruitment for Sustainable Transformation (FIRST) Program: FIRST Cohort (U54), and diversity focused career development awards (K99/R0, K01).

#9. Create a web-based resource on the Research Administration website that readily allows the user to identify the research and innovation expertise of our faculty. The purpose would be to: 1) Facilitate in-house collaboration, 2) Inter-institutional collaboration, and 3) Industry engagement and possible contract consulting relationships between research labs and industry partners (for example, the Cambridge model).

LOWER IMPACT CROSS-CUTTING INITIATIVES

#10. Enhance the capabilities and expertise within the core facility for drug development and discovery.

#11. Enhanced capabilities and expertise in the Vector Biology Lab

- *In vivo* imaging in the VBL
- High performance imaging in the VBL

#12. *In vivo* imaging capabilities for human and animal model systems, for example a 7T MRI for both animals and humans that is available to the research community at reasonable cost.

#13. New core facility for the production of induced pluripotent stem cells. Will need to understand what is being spent by Upstate labs for outside services to produce iPS cells.

APPENDIX C:

PRIORITY HIRES AND WORKING GROUP SPECIFIC IMPACTFUL INITIATIVES

The Synthesis Committee of the Research Strategic Planning process met on several occasions to extract from the working group reports, a distillation of priority hires to advance areas of strategic focus and to identify synergy between research strengths and the most impactful initiatives for each target area. It was also recognized that the SUNY Empire Innovation Plan faculty hires have been a powerful mechanism to advance the research mission of the University in high-impact areas and should therefore continue to be pursued in alignment with Upstate and SUNY shared priorities.

Currently Approved EIP hires:

- Two in environmental health and medicine, one at UMU and one at ESF
- Two in Alzheimer's
- One in addiction
- Two in vision research

The Bioinformatics Working Group Priority Hires:

- Experts in Medical Informatics, EHR data mining, coupling EHR and biobank data as skill sets with foci in the following areas:
 - o Clinical informatics
 - o Consumer health informatics
 - o Public health informatics

Impact Areas:

- Several of the cross-cutting initiatives positively impact this area.
- Extend the SUNY Oswego MS in Biomedical and Health Informatics to create a PhD program possibly in collaboration with Syracuse University and their machine learning program in the College of Engineering.
- Initiate a seminar series on Biomedical Informatics.
- Develop a graduate-level course on biomedical informatics and data analytics. This could be achieved, in part, by combining relevant nano courses into a single 3-4 credit course.

The Cancer Working Group Priority Hires:

- New Director of the Cancer Center.
- Reinitiate Cancer Center hiring in target areas:
 - o Tumor Microenvironment and Invasion
 - o Developmental Cancer Therapeutics
 - o Hematological Malignancies
 - o Translational Program in Urological Cancers
 - o Translational Program in Lifetime Survivorship
- Continue to expand expertise in Cancer Bioinformatics and Genomics.
- Recruit experts in Cancer Immunotherapy — this is a glaring deficiency at Upstate.

Impact Areas:

- Develop a research initiative in collaboration with The Department of Public Health and Preventive Medicine and The Center for Bioethics and Humanities to self-assess Upstate's patient population demographics as compared to local demographics; identify disparities in healthcare access, delivery, and outcomes; and identify major barriers to obtaining healthcare in local populations. This is a requirement for NCI designation and a CTSA application.
- Research to understand health disparities in the Central New York disability community.
- Develop an Office of Institutional Research. The lack of these capabilities has broad negative impacts across the research and educational missions in not being able to perform self-assessment across the enterprise and to gather and report on data for grants.
- New Department of Cancer Biology with the Cancer Center Director serving as Chair. This would provide a mechanism for the CC Director to recruit translational research faculty and clinical research faculty with protected time.
- Establish a new core facility in Pharmacokinetics to support drug development and pre-clinical trials with ADME capabilities (absorption, distribution, metabolism and excretion).
- Establish a formal mentoring program in translational research, pairing senior scientists (mentors) with junior clinical faculty and residents (mentees).

Clinical Research/CRU Working Group Priority Hires:

- Seasoned clinical researchers with protected time who can serve as mentors and will also provide PIs to apply for larger grants such as training grants.
- Junior faculty hires with protected time for clinical research.

Impact Areas:

- Cross-cutting initiative #2 (providing clinical researchers with compensated protected time) is the highest priority for this working group.
- Develop a financial support structure for deployable research nurses and clinical research coordinators that can also support off-hours patient visits to facilitate diversity in subject populations.
- Develop a strategy to be competitive for UL1 and KL2 educational grants from the NIH as the first steps to be ready for a CTSA application.
- Recruit or develop a home-grown translational researcher of Howard Hughes stature to be able to develop our own phase 1-2 clinical trials. This person could serve as the PI for a future CTSA application.
- Increase trials in cooperation with the VA, access the VA merit award system and additional NIH funding. This is a priority, in particular for Ophthalmology and Psychiatry.
- Aspirational long-term goal to obtain a 7T MRI for human and small animal use. A regional approach may make sense such as with the Cornell Veterinary School.
- Implement more EPIC research functionalities, this will require a task force to prioritize which functionalities would be most useful to Upstate researchers, a dedicated team in IMT to facilitate, and an expert in biomedical informatics to advise (priority hire of the Bioinformatics Working Group).
Some examples include:
 - o PROMIS (patient reported outcomes). PROMIS is particularly powerful for all chronic disease research, surgical outcomes and cross-cutting disabilities research; it crosses all sub-specialties.
 - o The ability to put Epic data in RedCap.
 - o Break through mindset that research data cannot be in Epic. For example, a COVID-19 registry would be extremely powerful to engage multi-disciplinary teams in SARS-CoV2 research.
- Rethink the model and range of expertise in the Clinical Research and Evaluation Core (CRE) housed in Public Health and Preventive Medicine to better support the range and diverse constituencies that could be served by this core.
- Database of patients willing to participate in a research study and/or who have previously participated in a study. Possible strategies could include:
 - o An "opt-out."
 - o Consenting at admissions.

- Establish an annual Clinical Research Retreat.
- Implement an internal checklist at application to consider addressing health disparities in grant proposals.
- Develop and implement a RedCap questionnaire to capture disparate demographics in research subject populations.
- Collaborate with community groups through community liaisons to develop research questions that address health disparities in the populations we serve.
- Develop a Clinical Research Coordinator certificate program, that includes real life internships, in the College of Health Professions.
- Develop a Master's program in clinical research in the College of Medicine or jointly between the College of Medicine with Public Health.
- Partner with Research Match.

CRU:

- Expanded footprint and create new satellite locations nearer to patient care, for example in the Nappi Longevity Institute, 550 Harrison or the Cancer Center.
- Allow CRU CRAs to float to ambulatory sites. There would need to be new CRA hires for this because we only have a lab technician who can do limited CRA functions but mostly works in the lab.
- There is a need for clerical support in the CRU to free up nursing time to cover registration, scheduling, billing, and CTMS support.

The Education Research Working Group Priority Hires:

- IRB support in the research compliance office to support education research IRB submissions; develop a social science specific IRB process.
- 1 FTE dedicated to academic data hygiene and strategy, could sit within the IT research support group.
- 0.5 FTE dedicated to research education in the Innovative Design in Education Accelerator (IDEA lab) that facilitates educational research projects.
- One graduate assistant to support education research projects, possibly from SU's School of Education.

Impact Areas:

- Create a centralized academic data warehouse with core educational data as well as patient data to help track education outcomes on patient care.
- Develop mechanisms to incentivize education scholarship and educational innovation.
- Provide funding for faculty development and travel to health professions education conferences.
- Develop a Center for Educational Innovation and Excellence including:
 - o An IDEA lab.
 - o An education research interest and writing group.
 - o A dedicated academic unit.
 - o A mentoring and professional development program.
 - o An annual education symposium.
 - o Develop educational tracks such as graduate level degree programs in education.
 - o Create an educational research grant review group.

The Entrepreneurship and Industry Relations

Working Group Priority Hires:

- An on-site tech transfer/liaison

Impact Areas:

- Increase the pool of entrepreneurial postdocs; could be an aspect of cross-cutting initiative #6, Expand the Postdoc Program.
- Raise branding awareness in particular of Upstate's entrepreneurial footprint and activities; an aspect of cross-cutting initiative #5, Improve the Institutional Profile.
 - o Enhance the externally facing webpage.
 - o Feature Upstate IP in marketing and communications.
 - o Leverage all media platforms to tell the Upstate innovation story:
- Develop an innovation slide deck and brochure.
- Implement an advertising campaign on Upstate innovation.
- Share innovation success stories on social media.

- Incentivize innovation and industry engagement:
 - o Develop faculty training in IP management (IP101 for new hires).
 - o Value entrepreneurship in Tenure and Promotion.
 - o Engage alumni entrepreneurs for mentorship, advising, and consulting. Such individuals can be identified from The College of Graduate Studies alumni.
 - o Create campus lab space for faculty, student and postdoc entrepreneurs to support entrepreneurial "spin ins."
 - o Implement a recognition program for Upstate innovators.
 - o Hold seed funding competitions that could be funded through IP revenue and industry support programs.

- Expedite and streamline transactions with Industry partners:
 - o Make publicly available our processes for engaging with industry, for example a flow-chart styled resource page for developing relationships with industry.

 - o Simplify and streamline contracting and IP licensing.

- Invest in development of service-oriented resources and events:
 - o Launch an Upstate proof-of-concept program to support and de-risk early-stage technology through seed funding and resources to get IP out the door.

 - o Support SBIR/STTR submissions with mentors and redacted successful examples; create a single resource for mentors to support and review grant submissions.

 - o Engage Centerstate CEO to attract investment and government support.

 - o Engage with SU's Whitman School entrepreneurship program to engage and prepare students and postdocs for industry careers.

 - o Build translational teams with business acumen in collaboration with SU, SUNY Oswego, and SUNY Binghamton.

 - o Provide funding to support industry-funded, industry driven projects.

- Develop a mechanism to match industry needs to our expertise, this could be an aspect of cross-cutting initiative #9-Create a Web-Based Resource of Faculty Expertise.
 - o Develop contract research services as fee-for-service based on faculty expertise (e.g., the Cambridge model) as well as units and resources that we can charge for to meet industry needs including market our core facilities.

- Invest a portion of IP revenues in pilot grants for early-stage technology.

Environmental Health and Medicine Priority Hires:

- Faculty who can synergize with ESF and SU faculty to grow the region's expertise in Environmental Health and Medicine.
 - o Faculty with advanced geospatial analysis skills in environmental health and medicine, in public health and preventive medicine/climate and eco-modeling focused on vector-borne diseases.
 - o An environmental virologist who goes beyond ticks and mosquitos, possibly a computational biologist centered on metagenomic environmental data analysis.
 - o Vector biology users of the VBL: fill the awarded EIP possibly with an expert in SARS and respiratory diseases.
- A health disparities researcher who encompasses the environmental component, this would fit with the cross-cutting priority hire area of health informatics.

Impact areas:

- Develop a coordinating center for vector-borne diseases, for example a Center of Excellence funded by state or federal funding, or as a WHO-Coordinating Center. This is a longer-term goal as much needs to be in place to be competitive, such as more faculty and postdocs in this area.
- Organize a local summit on environmental health and medicine; and a SUNY-wide initiative with Upstate as lead.
- Submit a T32 pre-doctoral training grant for vector-borne zoonotic disease with an emphasis on ecology/environmental impact. Training more PhDs in this area and in global health would positively contribute to our competitiveness for a CTSA.
- Submit a T31 postdoctoral training grant for vector-borne zoonotic disease with an emphasis on ecology/environmental impact. Training more postdocs in this area and in global health would positively contribute to our competitiveness for a CTSA.
- Invest in geospatial analysis expertise on emerging infectious disease in public health and preventive medicine even at the postdoctoral level.
- Submit a collaborative, multi-disciplinary grant to The National Institute of Environmental Health Sciences with investigators from ESF (Mary Collins).
- Identify funding for the tick surveillance program and expand into mosquito-borne diseases.

The Global Health and Infectious Diseases Working Group Priority Hires:

- Increase depth in infectious disease.
- Increase breadth in global health beyond infectious disease, for example chronic disease in global populations including population health expertise; cross-cutting with priority hires of the Bioinformatics Working Group.
- Experienced physician-scientists in general; cross-cutting with priority hires of the Clinical Research Working Group.

Impact Areas:

- Leverage the refugee population to bridge global health issues.
- Expand the BSL3 space beyond the current footprint of the Vector Biology Lab.
- Develop a broad population health program across service lines that also addresses social determinants of health; cross-cutting with impact areas of the Cancer Center and Clinical Research Working Group. The foreign platforms developed by The Institute for Global Health could help support such an initiative.
- Develop multi-disciplinary programs around specific disease states (example diabetes); knock down the silos. Increase interactions between like-minded investigators. There is a need to think of some creative solutions such as: virtual space for conferences, interest groups on the web, create spaces to interact informally. This could be an aspect of cross-cutting initiative #9, A Web-Based Resource of Faculty Expertise.
- Develop biomanufacturing capability for developing vaccines, immune-therapeutics and to facilitate home-grown drug development for pre-clinical trials and phase 1 trials to create in house bench-to-bedside capabilities.
- Develop a more productive relationship with the county and state DOH to enable health equity research.
- Increase clinical research space, for example expansion of the CRU and CRU satellite sites; overlaps with impact areas of the Clinical Research Working Group.
- Create a global health pathway for residents.
- Fund global health seed and travel grants.
- Apply for more large, multi-PI, multi-disciplinary NIH grants to increase our ultimate competitiveness for a CTSA application.

The Immunity and Auto-Immunity in Disease Working Group Priority Hires:

- Given the interdisciplinary nature of this area, all hires should have joint appointments. Many of the following overlap with priority hiring areas of other working groups:
 - o Genetics and biomarker development
 - o Regulatory T-Cells, cancer immunology and checkpoint regulation
 - o Immune driven disease and immunopathology
 - o Neuroimmunology and immunological basis of CNS disease
 - o Neurodegenerative disease
 - o Radiology hires to support research that utilizes MRI technology, for example in animal pathology. This would pair well with the expansion of imaging cores (EM) and the histopathology core.

Impact Areas:

- Create a translational research department or center of pathobiology to generate collaboration between basic, translational and physician scientists.
- Develop a one semester course for PhDs and postdocs in pathobiology co-taught by basic scientists and clinicians.
- Establish an immune-mediated disease interest center like the Lupus and Autoimmunity Center of Excellence (LACE) to drive multi-disciplinary research and grants.
 - o Large, multi-PI grants to NIH and DoD such as U19; establish a large grant meeting to pitch proposals.
 - o Submit a T32 training grant on auto-immunity and disease.
- Expand research participant pool, in particular to feed the biorepository; possibly leverage the donation program in anatomy.
- Acquire a research MRI that would be sustained with new research-focused hires in radiology.

Mechanisms of Disease Priority Hires:

- Structure-based drug design and high-throughput screening to build on existing strength in structural biology as a first step toward developing a larger drug discovery program.
- Alzheimer's and neurodegenerative diseases beyond even the existing approved EIP hires to build on existing strength, specifically in proteostasis.
- MDs or PhDs with 100% protected time to act as ambassadors to drive collaboration between basic science and clinical leaders across multiple areas; one focus area could be in cardiovascular research to further the research agenda of the Heart Institute.

Impact Areas:

- Develop forums for cross-departmental and cross-disciplinary discussions and discourse such as journal clubs, joint lab meetings, lightening short talks and grand rounds. Pick a few focus areas such as drug discovery, cardiac disease, neurodegeneration, or cancer that have a cross-disciplinary focus.
- Develop a drug discovery program/center that spans the spectrum of drug discovery and development: structure-based drug design, candidate drug screening, medicinal chemistry, pharmacokinetics and pre-clinical animal trials. This will require an analysis of what makes sense to build in house versus contracting with outside vendors.
- Develop an Assistant VP for clinical and translational research. One goal of this position would be to act as a clearing house for clinical research expertise. The research liaisons group suggested in the cross-cutting initiatives section could also contribute to these efforts.
- Develop mentoring programs
 - o Organize peer review panels to help review junior faculty grant proposals.
 - o Create an academy of research faculty to provide senior co-mentors for F30/31/32 grants. Obtaining more individual training grants will be a prerequisite for us to be competitive for training grants.
- Achieve a 50% increase in research funding over 5 years in part by obtaining larger, multi- PI/ multi-disciplinary grants.
- Initiate an interdisciplinary distinguished seminar series co-hosted by basic and clinical research departments and supported by the VPR.

Neuroscience Priority Hires:

- Recruit a Chair of Neuroscience and Physiology with an expansion/revitalization package and broad buy-in from the neuroscience community.
- Fill the approved Alzheimer's EIP positions (2). Recruit expertise in advanced retinal imaging and AI for the Center for Vision Research (CVR).
- Submit a proposal for a Neuro-oncology EIP hire.
- Add expertise in Neuro-virology and pathogenesis/neurodegeneration. Such a hire would overlap with the priorities of the Immunity and Auto-Immunity Working Group, the Vector Biology Lab, the Institute for Global Health and Translational Science, the Departments of Neurology, and Geriatrics.
- To strengthen and complement existing strengths, focus on hires in cell and molecular neuroscience, electrophysiology or systems neuroscience. These could be good target areas for a new Chair of Neuroscience and Physiology.

- Bioinformatics/Genomics/Proteomics — this skill set would be applicable to all of the other priority hiring areas in neuroscience.
 - o Hires in computational biology, machine learning, and AI would strengthen The Molecular Analysis Core.
- Neuro-Trauma (TBI) is a priority area to build for the Department of Neurosurgery.
- Focus on hiring areas that would drive clinical collaboration such as drug screening and development, iPSC-based disease models and regenerative medicine, neurorestorative therapy, gene therapy, tissue engineering and in vivo ocular imaging.

Impact Areas:

- Develop the behavioral core with new equipment, maintenance contracts and a Core Director.
- Increase capabilities in ocular imaging such as Adaptive Optics Scanning Laser Ophthalmoscope and Optical Coherence Tomography with Angiography.
- Increase communication to drive collaboration:
 - o Monthly seminars.
 - o Workshops on clinical-scientific topics of interest.
 - o Biennial symposium on neuroscience.
- Form cross-departmental interest groups to develop large multi-PI proposals.
- Focus on getting T35 (medical school), F31 (pre-doctoral) and F32 (postdoctoral) grants to make us competitive for larger institutional training grants.
- Develop new technological capabilities of high impact such as:
 - o Retinal regenerative medicine.
 - o Marmoset genome-editing capabilities.
- Initiatives to increase Inclusion and Diversity and address health equity:
 - o A dedicated person to develop URM pathways for high school students, college students and graduate students.
 - o Develop URM pipelines with OCC and its partners such as SUNY ESF and SUNY Oswego as well as historical black colleges and Hispanic-serving colleges
 - o Obtain a PREP (post-baccalaureate research program) grant from the NIH.

FACILITIES:

Impact Areas:

- Establish a research space planning committee that will review and provide feedback on the campus master plan and be advisory to the Deans and VPR.
- Begin a phased approach of remodeling laboratory space in Weiskotten and the Weiskotten Addition to meet research growth needs.
- Develop additional CRU capacity and satellite spaces located near ambulatory sites of care such as through expansion of The Nappi Longevity Institute.
- Finalize and share a research space allocation plan that is tied to metrics to create transparency in research space decisions.
- Identify space for new cores, for example bioinformatics and data storage/analysis and look for ways to consolidate core spaces.

TECHNOLOGY:

Impact Areas:

- Establish a unit within IMT dedicated to research technology planning and support, including Linux expertise, that reports jointly to the VPR and CIO.
 - o Ensure remote access for all users to shared equipment and core facilities; remote access policy is problematic for privately owned computers (for example graduate students and postdocs). VPN access for the campus that is separate from the clinical enterprise. Put security software on private computers, again relevant to graduate students and postdocs. More technical support for Apple computers. This will require a task force to understand all of the needs and develop and implementation plan.
 - o Increase IT support for the clinical research enterprise including EPIC support for EPIC functionalities. This is described in detail in the Clinical Research Working Group report.
 - o Assess needs in research groups for support and proactive training for labs and research groups in the use of project management and data sharing software such as Basecamp and Microsoft Teams.
 - o Create a technology onboarding manual for faculty.
- Establish robust data storage, sharing and retrieval solutions with intuitive interfaces. Create and manage research registries locally with our own data. This is also described in detail in the clinical research report.
- Analyze the CRE to identify additional needs and expertise.
- Implement policies, procedures and best practices for research data management.
- Provide additional support in the training and effective use of research technologies.

OPERATIONS:

Impact Areas:

- Multiple working groups asked for a full-time grant writer in the research development office. We could look into a company or freelancers that do this. This is particularly important for clinical faculty submitting grants.
- Create mentoring infrastructure for internal review of grants, possibly department focused, in particular for junior faculty and clinical faculty.
- Develop a website for Upstate faculty to identify potential collaborators based on scientific expertise. Better education of faculty on PIVOT and Dimensions, with additional IMT support, may help solve this issue.
- Expand the pre-award office to support increased volumes and to create the bandwidth for pre-award staff to provide staff and faculty training programs.
- Develop better communication between Research Administration and the Office of Graduate Studies to support obtaining training grants, fellowships and developing pipeline programs. Establish monthly or quarterly joint staff meetings to help drive better communication.
- Develop data management policies, procedures and support in collaboration with IMT and the Library.
- Create an Office of Institutional Research for campus data.
- Create customized dashboards for Chairs and PIs (PIs in particular are challenged to get data) by bringing this data into Tableau, including financial data. Engage the Moonshot team in this initiative. Is there a need for a dedicated programmer?
- Develop investigator-friendly, transparent and easy-to-navigate systems for purchasing, accounts payable, research accounting, and travel, publish contacts, forms and processes on the research post award webpages.
- Create an interactive process map for award life-cycle.
- Develop a faculty development series on Upstate policies, procedures, and navigating Upstate administrative processes. Incorporate this information into faculty onboarding and develop a faculty handbook that would include offices/resources, cores, fee structures, policies, the T&P process etc.
- Improve the efficiency of self-serve applications.
- Implement award management sessions to provide smooth transitions between pre- and post-award through regular meetings between pre- and post-award.

- Increased participation and engagement between Upstate and key RF Central Office Committees to help the RF understand Upstate's specific needs and to increase advocacy for our needs.

APPENDIX D:

WORKING GROUP SPECIFIC REPORTS

BIOINFORMATICS AND MEDICAL INFORMATICS WORKING GROUP REPORT

Chunyu Liu, Isabelle Bichindaritz, Vladimir Kuznetsov, Scott Elia, Steve Faraone, Wenyi Feng, Frank Middleton, Thomas G. Schulze

1. Current strengths and capabilities.

In the 21st century, bioinformatics and medical informatics (BMI) are essential for the success of medical research. Yet, at SUNY Upstate Medical University (SUMU), BMI rests on very limited infrastructure, support and faculty involvement. We have world-renowned investigators who are very collegial and open to collaborations, a friendly research environment and very supportive leadership. We already have several “seed” well-funded investigators with expertise in population genetics, transcriptomics, epigenetics, genomics, systems biology, and machine learning. They have collaborative projects across the United States and worldwide in diverse research fields.

Within a medical university, we will focus on developing BMI, which involves two highly-connected and independently defined disciplines: bioinformatics and medical informatics. Bioinformatics applies computer technology and modeling methods to biological data and their analysis, emphasizing the biology, basic science aspects. Today, bioinformatics is a well-recognized biological discipline that provides significant influence to these fields via computer and data sciences, algorithms, mathematical models, and statistics applications. Medical informatics focuses on developing and using information technology that applies to medical data and knowledge to improve health care. The interdisciplinary biomedical informatics should uphold the FAIR principles: findability, accessibility, interoperability, and reusability.

Currently, Upstate has more expertise and research activities in bioinformatics. To be competitive, we must strengthen bioinformatics and expand into medical informatics.

To improve BMI, we must invest in hardware infrastructure, technical support, new hiring and new training programs. We need to provide an environment that attracts talent investigators, makes our NIH grant applications more competitive, attracts collaborative projects, and attracts investments of any sources, public or private, to advance our BMI program and increase our capability and visibility.

2. Technical capabilities, including personnel expertise and specialized instrumentation.

In 2013, 2015, 2018, the faculty were surveyed about bioinformatics at Upstate. These surveys found that the need for bioinformatics was growing in and that it would be desirable to have a bioinformatics core facility on campus. In 2017, Dr. Edward H. Shortliffe, President Emeritus of the American Medical Informatics Association, was invited to assess the current status of bioinformatics here. Dr. Shortliffe concluded that Upstate needed an academic biomedical informatics unit, faculty with formal bioinformatics training, and informatics in the medical curriculum.

Drs. Frank Middleton, Steve Faraone, Steve Glatt, Vladimir Kuznetsov, Wenyi Feng, Chunyu Liu, and a few other faculty have significant efforts on bioinformatics, primarily on genomics, transcriptomics, and epigenomics, including machine learning, related to psychiatry and oncology. The SUNY-Molecular Analysis Core (MAC), led by Dr. Middleton, provides limited bioinformatics support for faculty and students.

Faculty have very limited access to high-performance computing platforms for large scale sequencing data. Several PIs have their own small standalone servers or workstations. External collaborators' resources have been used. The recently established SUNY AiMOS system is potentially useful, but has restrictions of computing time and storage space that make some projects infeasible.

The Epic System has accumulated much medical record data, but it has not been used for any significant research as it is not easily accessible. Upstate's participation in TriNetX was a good development, although accessing data is slow, and the inability to extract location information makes it useless for some NIH grant proposals. In parallel, the Department of Urology chair Dr. Bratslavsky has been developing a cancer-centered biobank. He and Dr. Schulze head a team to develop a campus-wide biobank linked to the electronic health records (EHR).

There has been a history of collaborative efforts between Upstate and area SUNY institutions. Successful examples include the Biomedical Informatics facilities, classrooms, high-tech labs, and a high-performance computing infrastructure at SUNY Oswego's Syracuse Branch Campus and the Institute for Precision Cancer Research Education and Care. Since 2012, Dr. Isabelle Bichindaritz at SUNY Oswego has been leading an Intelligent Bio Systems (IBioLab) laboratory dedicated to research and training in biomedical informatics, with a strong emphasis on machine learning, artificial intelligence, and bioinformatics.

Syracuse University (SU) also has investigators interested in bioinformatics. The Faraone Lab has established a collaboration with Dr. Asif Salekin, from the Department of Computer Science at SU. Machine learning is the emphasis of their current collaboration for both education and research programs. We may further expand our access to other expertise in the SU Computer Science department, which we can tap into as needed for specific projects.

3. Funding trends and extrapolate to characterize the opportunity space around future funding trends.

Over the last ten years, hypothesis-free, data-driven research has increased dramatically. Large projects based on big data will contribute more and more to the evolution of modern medicine. Large sample sizes are essential for producing reproducible findings and for leading to improved diagnosis and treatment and new translational directions. High-throughput multi-omics data provide comprehensive information to advance biomedical research. Processing and analyzing the big data require considerable resources of computing and knowledge. Investigators need to be prepared for the challenges, need to develop skills and infrastructure to participate in data production and to process big data.

Upstate is not in the position to compete for large center grants in bioinformatics, although bioinformatics and medical informatics could play a significant role in supporting other Upstate Institutes, such as Cancer, Aging,

and Vision, to compete for large grants. NIH F30/F31 training grants can be pursued in a similar configuration. Multi-PI collaborative grants can attract large funding support as well. To build up infrastructure, a critical mass that can support these grant applications requires careful, collaborative planning and serious investment.

Machine-learning and multi-omics data analysis are areas where Upstate has expertise in place. We should increase awareness and promote collaborations between our bioinformatics groups and other research teams on campus. Bioinformatics cannot reach its full potential until all investigators appreciate its value, understands how to communicate with bioinformaticians, and actively involves bioinformatics in their research projects.

An Upstate-wide biobank connected to the EHR will enable data-based collaborative research opportunities. Multi-Institute grants and consortium projects are frequently awarded to those Institutes that have invested in the biobank-EHR resource. Upstate should join this race.

4. New faculty hires

New faculty hiring should prioritize faculty who can help us build collaborative networks within the current bioinformatics groups or between our groups and other basic science groups. Examples are those with formal BMI training, connections to the BMI community, expertise in big data, multi-omics data analysis, machine learning applications and computer image analysis. Since Upstate does not have much expertise in medical informatics, an expert in EHR data mining and EHR- biobank is our first choice.

Adjunct and affiliate appointments might be a useful intermediate step to develop BMI here. When funding is possible, we should hire more informatics professors to support data science and big data analysis. Because BMI is a vast field, it would be advantageous to hire professors who could spearhead additional BMI research areas, such as clinical research informatics, clinical informatics, consumer health informatics and public health informatics. The EHR/Biobank project could lead to hiring a leader in clinical research informatics or clinical informatics, whose expertise would enrich the current bioinformatics expertise and attract funding.

5. New instrumentation and core expertise

Building the BMI will be expensive. It requires continuous investment with a clear vision and goal. Upstate should provide infrastructure for computing, storage, and sharing. Along with the computing infrastructure, we need IT personnel to support research systems with bioinformatics capabilities. Significant work upfront to establish a governance structure will be important. A “Computational Core” to support research would include:

1. On-site facilities: We need centralized computational and storage resources with the capability for researchers to incrementally pay for CPU, GPU, memory, and storage as needed.
2. Cloud access: Cloud contracts for research are currently handled by individual departments or researchers. Envisioned are centralized contracts with cloud vendor(s) and capability for researchers to incrementally pay for resources as needed.

3. **Sharing:** Currently, data sharing is problematic, especially for large data sets. A patchwork of methods is used. Envisioned are a set of convenient, safe, supported solutions optimized for: administrative functions, small and medium-size files easily shared with external collaborators, large and massive data sets safely shared with external institutions.
4. **Support:** Current support does not encompass the breadth of IT technologies needed for research. Support for Cloud, Linux systems and storage needs to be provided so that researchers do not have to contract for, and rely on, their own support resources. Envisioned is a shared support function in the Computational Core. This would add support for Servers, Storage, Linux, Cloud, and other technologies. We need support to evaluate technologies. It is understood that technology standards would need to be established, vendor contracts negotiated, and a fee structure established, optimally based on incremental use.
5. **Collaboration:** Centrally managed collaborations and vendor arrangements could provide resources without up-front hardware investment by Upstate. Examples include Globus Online for sharing, SUNY AiMOS for computing, and the TriNetX network for EHR research.
6. A draft strategy to engage, mentor, and build collaborations with clinician-scientists in order to increase Upstate's translational research portfolio.

One of the goals of the BMI is to develop a set of comprehensive bioinformatics and analytical tools to convert diverse and dispersed big data into knowledge, mechanistic hypotheses, and predictive models that lead to discoveries and innovative translational research in medicine.

BMI needs participation from the clinical division. To create a translational research program that has a substantial component of human participation requires an institutional commitment that a) makes research a priority in clinical units and b) frees up clinician time for research. Incentives for clinicians should engage them in research.

Translational research requires constant conversation between researchers and clinicians. Workshops, seminars, journal clubs, and lab open-houses would promote this conversation. Clinic scientists need protected time and research mentoring. We need to attract student trainees from the clinical sector to work alongside trainees from the basic science department.

7. A draft strategy to engage, mentor, and build collaborations with early-career faculty (ECF), fellows, residents, and students.

In the basic sciences, there is sufficient mentoring time for early-career research faculty and students. On the clinical side, it is impossible to mentor fellows, residents, and ECFs because a) many are not interested in research, and b) they have no protected time for research. Expanding funding for the MD/Ph.D. program would improve our ability to mentor medical students.

To create a central BMI presence and visibility, we could create a website featuring area experts that early-career faculty, fellows, residents and students could visit and contact. A summer school, tutorial days or hours,

workshops, and seminar series would promote education and communication. Upstate internal grants or joint grants with SUNY Oswego would encourage investigators, fellows, ECF and students to carry out BMI projects.

There had been an effort to develop a PhD program in BMI, jointly among Upstate, SU and other institutions. Oswego has an MS in Biomedical and Health Informatics that could be extended to a joint PhD program in BMI. Upstate, SU and Oswego may develop a PhD program in a 2+3 type of arrangement, with 2 being MS in Oswego Syracuse campus or SU, and 3 being the BMI PhD in Upstate.

8. A draft strategy to address health equity research as part of the portfolio in the focus area.
SUNY should create Empire Scholar slots that attract a diverse faculty. NIH has programs supporting trainees of diverse backgrounds (<https://www.nigms.nih.gov/training/diversity/>) and grant opportunities related to diversity (<https://extramural-diversity.nih.gov/guidedata/data>). Even though we are not currently competitive for most of those, we should plan and prepare to improve our competitiveness. Establishing collaborative BMI-related training programs with colleges serving black and Latino communities may create new sources of talented trainees.

The EHR-biobank project should consider emphasizing access to under-served populations, including immigrants, people of color and native Americans.

Establishing training program, research sources that emphasizing diversity may create new opportunity for Upstate to compete in the BMI.

9. Aspirational goals in your area that could be achieved in the next 5-10 years.
 - 1) Create Masters and PhD programs in BMI in the Syracuse area with the participation of several local institutes.
 - 2) Create an agreement with SUNY Oswego's Biomedical and Health Informatics MS to allow selected students to pursue a Ph.D. in BMI.
 - 3) Reach out to colleges of under-served communities to attract talented students.
 - 4) Create an Integrative research program of BMI with Upstate Cancer Center and clinical departments to enhance collaboration, and submit fundable collaborative grants with substantial BMI components.
 - 5) Create a workshop or seminar series on BMI to promote communication.

If additional funding is available, the following should be within reach:

- 1) Create an Institute, Center, or Core in BMI that includes faculty, supporting staff, computing infrastructure, and new MS, PhD training program.
- 2) Hire new faculty with expertise on medical informatics, related to big data, EHR/biobank.

10. Additional initiatives and approaches that would move the needle in your area.

- 1) Create a better web presence and common branding for presentations, publications, and grant applications.
- 2) Offer cross, adjunct appointments for interdisciplinary faculty across the SUNY campus, even across the country.
- 3) Develop a unique EHR-biobank that supports worldwide collaboration and attracts BMI talent, collaborations, and investments. Promote patient-education, universal consent for research, a new centralized database to manage biomaterials with the possible interaction with TriNetX and Epic.
- 4) Next-generation sequencing could be introduced to be part of our EHR/biobank to enhance the data contents and research values. Medical genetics could be enhanced as part of the research and routine clinical service.

Restructure the IMT support for BMI's computing and data-sharing needs. BMI will be one of the top major consumers of the University IT service, along with clinical service.

CANCER WORKING GROUP REPORT

UPSTATE RESEARCH STRATEGIC PLANNING 2020

Mehdi Mollapour (chair), Teresa Gentile, Steve Graziano, Jessica Henty-Ridilla, Christine King, Leszek Kotula, Stewart Loh, Megan Oest, Chris Turner, Mariano Viapiano

Abbreviations: CC=Cancer Center, CCRP=Cancer Center Research Program, NCI=National Cancer Institute, UCC=Upstate Cancer Center

OVERVIEW: A unified vision to advance Upstate cancer research towards better patient care.

The Research Strategic Plan below aligns cancer research programs at Upstate with the current goals of the Upstate Cancer Center via the creation of either an Institute or Department of Cancer Biology. The success of these recommendations hinge on the hiring of a Director for the Cancer Center. This currently vacant position is critical for final decisions in several strategic plan initiatives including: communication and integration of research initiatives with other departments at Upstate, hiring (i.e. navigating/matching hires in basic science departments with cancer center initiatives), negotiating adequate protected research time for clinicians, aligning tools in core facilities with current research strengths, and ultimately the vision to obtain NCI Cancer Center designation. Such a Director should have credibility in the cancer field to steer UCC towards NCI designation.

1. Current Strengths

Translational & Basic Science Research: SUNY Upstate established a Cancer Center Research Program (CCRP) in 2016 with the goal of strengthening cancer-related research resources and activities. Since its inception, the CCRP has developed a number of initiatives, such as:

- A. Pursuing faculty hires with a focus on cancer research
- B. Identifying equipment needs and securing funds to purchase shared instrumentation
- C. Inviting external speakers and maintaining a seminar series with focus on cancer research
- D. Establishing multidisciplinary research programs to leverage existing expertise at Upstate.
These programs currently include:
 - i. Tumor Microenvironment & Invasion Program: focused on the mechanisms of cancer initiation, progression, and therapeutic resistance
 - ii. Translational Program in Urologic Cancers: focused on the mechanisms, diagnosis and treatment of urologic malignancies

- iii. Developmental Cancer Therapeutics Research Program: focused on development of cancer drugs, biologics, and delivery systems
- iv. Lifetime Survivorship Research Program: focused on post-cancer survivorship and quality of life

Together, these programs include faculty from all basic science departments as well as multiple clinical departments, such as medical oncology, orthopedic surgery, neurosurgery, pathology, endocrinology and urology among others. The CCRP has incentivized collaborations in these programs through an annual Cancer Center Pilot Grant program, which favors research teams combining clinical and basic science expertise.

Clinical Research: Upstate Medical University has been a main member institution for NCI-sponsored clinical trials for over 40 years, first for the Cancer and Leukemia Group B and more recently for the merged group The Alliance for Clinic Trials in Oncology (“Alliance”). There is a balance of trials available through the NCI Cooperative Group mechanism (Alliance, ECOG-ACRIN, SWOG, GOG, etc.) through the Clinical Trials Support Unit, The Alliance Foundation (which supports Cooperative Group research), industry-supported trials, and investigator-initiated clinical trials. In October 2020, we had 71 actively accruing clinical trials with studies originating from Cooperative Groups 62%, Industry 23% and Investigator-Initiated 15%.

2. Resources

Existing Clinical Capabilities: There is an extensive infrastructure to support Cancer Clinical trials that is under the umbrella of the institution (Clinical Trials Office, Research Accounting), the Cancer Center (Lead Clinical Research Associate (CRA), Budget Contract Specialists, Regulatory Specialists, Deployable CRAs), and the department level (CRA’s to support Medical Oncology, Radiation Oncology, Urology, etc.). Various fund pools go to support these functions. Clinical trial grants support institutional functions through indirect funds and direct funds go to support patient care costs and the salaries of CRA’s. A list of support for the clinical trials efforts is as follows: Clinical Trials Office, Local and central IRBs, Research Accounting, Research Pharmacy, Committee structures (including Cancer Center Scientific Review Committee, Cancer Center Research Committee, Associate Director for Clinical Research, and Cancer Center Leadership Committee), Cancer Center Lead CRA, Budget/Contract Specialist, Regulatory Specialist, and Department CRAs.

Clinical Research Unit (CRU): A specialized unit that provides support for clinical research including clinical trials, The CRU comprises eight research nurses, one physician assistant, and a clinical research associate / lab tech. The CRU has a dedicated nurses’ station, ten private rooms, available monitor space, two specimen processing labs, and dedicated supply storage.

Existing Equipment Capabilities:

- A. Drug Screening: A Molecular Analysis and Drug Screening Core provides resources for screening of small-molecule libraries and for analysis of protein-ligand interactions, including instruments to perform isothermal titration and differential scanning calorimetry, biolayer interferometry, HPLC with mass spectroscopy, X-ray diffraction, and computational modeling of drug-target interactions.
- B. Imaging: Multiple imaging facilities throughout the institution, including the Advanced Microscopy Core (IHP) provide instrumentation for conventional widefield, confocal, multiphoton and super-resolution

microscopy, including systems optimized for time-lapse and in vivo microscopy. In addition, a new Leica Microscopy Center of Excellence established in 2018 provides further resources for advanced microscopy and sub-cellular imaging resources

- C. Cell & Molecular Analysis: The SUNY Upstate Molecular Analysis Core provides all the resources needed for next-generation sequencing, genotyping, chromosomal mapping, ChIP-seq, qRT-PCR, multiplex protein assays, and laser microdissection. Additional cores provide critical support for flow cytometry, cell sorting, electron microscopy and mass spectrometry for proteomics and metabolomics.

Other Existing Capabilities:

- A. Animal Studies: The Department of Laboratory Animal Resources provides animal housing, surgical facilities including anesthesia/ventilation support, veterinary services, and hematology analytical services. Instruments suitable for animal studies include in vivo fluorescence/luminescence imaging systems, micro-computed tomography, high-resolution ultrasound, and experimental total body radiotherapy cabinets.
- B. Public Health: The Department of Public Health and Preventative Medicine houses the Center for Research and Evaluation, which provides research expertise in environment-health interactions, clinical trials design and analysis, statistical genetics, global health, and public health practice.
- C. Upstate Cancer Center Biorepository: A newly formed biobanking initiative has started to collect, bank and distribute patient tissues from many types of cancer for research purposes.

3. Funding

NIH Reporter and Federal Reporter were queried for all awards to Upstate, years 2014- 2020, and filtered using the keyword "cancer." Project association to cancer was manually validated based on project abstract information using generous inclusion criteria (e.g., awards only tangentially related to cancer were retained in the analysis).

Observations on Past and Current Funding:

Funding from NCI dropped from 2014-2020, while overall funding for cancer-related research maintained or increased slightly. During this time span, NCI funding represented only 17.6% of the Upstate federal funding portfolio (39.7% NCI funding in 2014, and 4.3% in 2020). This occurred concurrent with the drop in NCI new R01 funding success rates (13.4% in 2016, 9.9% in 2018).

- A. The bulk of NCI funding at Upstate is/was held by a small handful of labs with R-series awards that have been renewed for many years (C. Turner in CDB; M. Cosgrove, B. Knutson, S. Wilkens in Biochem), and some funding through Urology (L. Kotula, M. Mollapour), Pharmacology (J. Luo, H. Lu).
- B. While at least 25 current Upstate faculty have federally-funded cancer-related research programs, only six have received NCI funding. The remaining 19 investigators have funded their research through alternative NIH agencies or federal programs (e.g. CDMRP, NSF).

- C. New R01 success rates at NCI are low compared to most other institutional centers.
- D. The CC pilot grants have met with mixed success in terms of generating new NCI funding. To date only one award has been converted into NCI funding (R21 mechanism).

Notes for Future Funding:

It will be challenging to encourage investigators to pursue NCI funding for cancer-related research due to low success rates at NCI relative to other NIH agencies, and higher success rates for renewals. For example, the 2018 success rates for new R01s were 9.9% at NCI, but 24.5% at NIBIB and 23.4% at NEI. Strategically, it makes the most sense for investigators to submit their applications to agencies with high funding rates in order to keep their labs afloat and meet tenure/promotion goals. In order to encourage faculty to pursue funding through NCI, additional support would be needed through departmental, cancer center or Upstate initiatives.

4. New Hires

Hiring Goals for the Cancer Center Research Program:

Hiring goals established during the initial phase of the CCRP were difficult to strategically pursue with the directorship position yet to be filled and the intrinsic differences between programmatic priorities of the Cancer Center and basic science departments. To achieve a robust wave of new cancer research-oriented hires, priorities should include:

- A. Prioritize hiring a non-interim director who will identify areas of strength in cancer research at Upstate and will reorganize current programs to make such strengths into priority areas for growth. That person should have national visibility and credibility as a superb researcher and leader in the field of cancer, along with a very robust record of NCI funding. Without that type record, a new director would not be well positioned to guide others at UCC towards research success. A successful director will leverage one or more cancer research programs that will put Upstate on the map and will create the perception of an institution with highly specialized clinical and research expertise that will appeal to patients, donors and national funders.
- B. Reinitiate the previously suspended CCRP-affiliated faculty hiring process, where faculty are identified within a CCRP research program and matched to a home department, department, including the proposed — future — Cancer Biology Institute or Department. To avoid perceived favoritism, each department could be allocated a salary line and given responsibility to recruit a faculty hire.
- C. Grow expertise and capabilities in core areas that would broadly support cancer research, including bioinformatics, histology, broader tissue and/or biofluids biobanking, and improved data access/storage. Additional medical oncology faculty could improve capabilities in tumor microenvironment research.
- D. Improve public perception of research activities at the Cancer Center to attract new faculty hires. In current form, the CCRP is a virtual entity, not well advertised, and cancer research at Upstate appears nearly non-existent. The perception of a more coherent program could be improved by encouraging investigators

to identify as CCRP-affiliated in publications, more frequent updating of websites, and recognition of cancer-related publications, grants and conference proceedings by the CCRP.

5. Equipment

New Capabilities to Advance Cancer Research:

- A. Cloud-based Computing Core: A computer server used for analyzing large datasets (for example: RNA sequencing data, particle tracking analyses, image reconstructions, modeling endeavors). The presence of this core could drastically reduce the time these analyses currently take on systems built “in house” by investigators. With restrictions on what funds are able to be used to purchase these types of supplies many researchers cannot afford to build and maintain such systems for just a single-lab’s use.
- B. Biological Materials Facility/Floating Technician Program: A facility manned by one key person that has broad technical experience. Core funds itself in a fee-for-service providing a one-stop-shop for education/ advice or services in cloning, multiple protein expression systems, protein purification, PCR, qPCR, CRISPR, mammalian cell culture, etc. This facility could also facilitate/coordinate tools of other cores currently on campus. In addition, this facility could be used to train technicians/support staff capable of “floating” to different departments/laboratories to execute clinical research endeavors, cover basic scientist researcher leaves (sabbaticals, FMLA, etc), or to support junior faculty setting up their labs. Work more closely with the Upstate Biotechnology program to recruit/retain well-trained lab support personnel.
- C. Data Storage: Lack of cloud storage for large data sets is a major limitation faced by many researchers. Cloud storage is needed for investigators using RNA-seq, high resolution microscopy, computed tomography, and molecular biology. In the absence of cloud storage, or even an accessible network drive, researchers are paying out of pocket to fill the gap, or letting their needs go unmet. The effective use of cloud/networked storage options will require an intuitive user interface, a structure or framework for the retrieval of stored data, and supporting policies, procedures, and personnel.
- D. Histology Core: The absence of a histology core is a major limitation for many researchers. Current solutions involve investigators purchasing histology equipment and doing it themselves, paying outside companies, or asking clinical pathology to cut sections as a favor. Often a specific section or view of tissue is needed, and this is difficult to communicate to outside vendors. Having a dedicated research histologist would improve the quality of our research outcomes, and be highly attractive to future faculty hires.
- E. Biostatistics/Bioinformatics Core: The lack of a fee-for-service biostatistics/bioinformatics core is a major limitation. Most investigators who utilize large screening-type data sets (e.g. RNA-seq) are not equipped to conduct statistical analysis on this data, and to date hiring efforts have not addressed this deficiency. While some recent hires have more expertise in biostatistics, they are expected to run their own research programs and lack the time/expertise to address the growing needs of other researchers at UMU.
- F. Pharmacokinetics/Pharmacodynamics/ADME Core: This core facility would bridge needs between basic science and clinical investigators, providing expertise in ADME- TOX and PK/PD assessments for clinical and pre-clinical drug trials. This would allow Upstate to drastically expand the portfolio of investigator-initiated and phase I clinical trials.

6. Collaborations Towards Translational Research

Developing a strong and ever-growing portfolio of translational research should be the driving goal of any academic medical institution in order to align its scholarly goals with its healthcare mission. Establishing translational research in oncology at Upstate will require sustained effort in three interrelated areas:

- A. Education of the academic community on translational science.
- B. Formalization of collaborator and mentor-mentee relationships to pursue translational research.
- C. Prioritization of translational research at the institutional level in order to respond to health needs.

Recommended strategies to improve Upstate’s translational cancer research portfolio include:

- A. Establish a Translational Cancer Research Office (TCRO) within the CC organizational structure. Although translational research stewardship has been largely allocated to the Institute for Global Health (IGH), IGH involvement in cancer research has not yet materialized. A transitional approach (e.g. naming an IGH representative to assume specific duties on translational research in cancer) could be applied in the interim.
- B. Increase the representation of the institution at regional and national initiatives and organizations for translational research, including UNYTE (Upstate NY Translational Research Network) and the ACTS (Association for Clinical and Translational Science). Increased representation will allow Upstate to gain visibility and access to funding from NIH’s Clinical and Translational Science Award Program (CTSA) and NCI’s Translational Research Program (TRP) from the Division of Cancer Treatment and Diagnosis.
- C. Establish a formal program for mentor-mentee collaboration in translational research, pairing senior scientists (mentors) with junior clinical faculty and residents (mentees). Such a program could be initiated with one year-long partnerships (protected time supported by the mentor/mentee departments) focusing on expanding Upstate’s research portfolio. In this regard, a critical task for the Translational Research office would be to drive departmental engagement and increase the “buying-in” of clinical department stakeholders.
- D. Establish initiatives specifically dedicated to supporting translational cancer research, such as:
 - i. Immersion Day: A half-day activity introducing clinical challenges, novel diagnostics, and experimental therapeutics. Collaborative groups will be formed, and further mentored/fostered by the TCRO.
 - ii. Translational Cancer Research Pilot Award: Awards (2-year duration) supporting collaborative projects (clinician-scientist teams) to address specific needs in cancer diagnosis or treatment. These awards could supplement or replace the current CCRP intramural awards, focusing on well-defined translational projects detailing clinical need, deliverables, and a defined path to NCI funding. This program should pursue local/ regional community support (e.g., corporate sponsorship) through the Upstate Foundation.

- E. Compile the annual outcomes of all translational initiatives in cancer research and disseminate the following:
 - i. An intramural scientific report to highlight advances in the translational cancer research portfolio of different departments or laboratories.
 - ii. Local and regional press releases to showcase patient care advances and show the public a significant return on investment.

7. Mentoring

Beginning in 2016, the CCRC introduced plans for developing the cancer research programs of junior faculty and building collaborations between basic and clinical scientists. The CCRC also advanced several programs to promote training and education of medical students, graduate students, and residents at Upstate.

Recommendations to strengthen mentoring in cancer research include:

- A. Career development of early stage investigators. Use the early-career, pilot intramural award mechanism. This mechanism can be further improved to prioritize collaborations between basic scientists and clinicians, as indicated in the Collaborations section (item 6-B) above.
- B. Proposed programs for training and education of students and residents:
 - i. Path to MD, PhD for Medical Students: Distinct from the MD/PhD degree, this program would be offered to top medical students who develop significant oncology interest, with a strong possibility of becoming a principal investigator engaged in cancer research. At the end of the MS2 year, students would be given a one-year stipend, through the Office of Research for Medicine Students, for cancer-related research; exceptional students will be invited to continue toward the PhD after this year, while others return to MS3. Students would not pay tuition during the PhD phase, returning to the MD program upon PhD completion. Students will be awarded MD, PhD degrees.
 - ii. Masters in Cancer Research for Medical Students: This would be geared toward students who desire research experience in cancer but are not considering the MD, PhD option. Upon transfer of the required number of credits, MS1/2 will switch to the research program under a qualified mentor. The student will pay tuition and receive a one- year stipend to work in the laboratory. The participant is expected to receive an MS degree in Cancer Research, then return to the MS3 program.
 - iii. Research Fellowships in Cancer Research for PhD students: To train future basic cancer researchers, the top PhD students whose research involves studies of cancer mechanisms will be awarded a one-year stipend in the fourth or fifth year of their graduate program. Graduate fellowships will be competitive and will involve review of the student's accomplishments and proposed research project.

iv. Research Fellowship in Cancer Research for Clinical Residents: This opportunity is for residents who develop a special interest in cancer research during their clinical training. This program will offer support for laboratory supplies and a portion salary for residents' salary for up to 12 months. Selection of fellows will be competitive with a key factor being the involvement of a clinical mentor who will oversee the fellow's progress in partnership with a research mentor from a basic science department.

8. Health Equity

Social inequities and systemic discrimination have prevented people of diverse backgrounds and experiences from having equal opportunities for healthcare, resulting in health disparities such as elevated risk of getting sick, difficulty in obtaining treatment and higher death rates. These disparities are particularly pernicious for cancer patients because efficient treatments require access to surgical or medical centers at large population centers, ease of transportation, available childcare, tools for telehealth, flexible work accommodations and proximity to medical professionals for long-term palliative/supportive care. Patient-provider cultural differences and communication/language barriers further exacerbate these disparities.

Actionable items* that may promote more equity in cancer research include:

- A. Develop programs that increase the diversity in the pool of trainees, researchers, clinicians, healthcare workers, and administrators.
- B. Train employees at all levels to identify, intercept, and interrupt all forms of discrimination and racism.
- C. Develop mechanisms and training for Upstate students/employees to consistently address knowledge gaps and attitudes that perpetuate patient healthcare inequalities.
- D. Establish support groups and building partnerships between Upstate learners, researchers/clinicians, employees, and community organizations to increase access to healthcare and information, tools, and resources through channels and in formats and languages suitable for diverse audiences.
- E. Provide/ensure services for chronic-disease management to prevent illness are maintained and accessible. Provide patient support (e.g. reminders, self-care management programs).
- F. Develop a research initiative in collaboration with Public Health to self-assess Upstate's patient population demographics (compared to local demographics); identify disparities in healthcare access, delivery and outcomes; and identify major barriers to obtaining healthcare in local populations.

*Adapted from the 2020 Upstate Diversity and Inclusion Task Force Report, the Center for Disease Control (CDC), and the 2020 AACR cancer disparities progress report.

Addressing healthcare inequity is also an important component for ensuring fully informed consent in preparation for medical procedures, enrollment in a clinical trial, or donations of tissue or information to medical science.

9. Mid-Term Goals

- A. Identify areas of strength in cancer research and recruit NCI-funded faculty to increase the critical mass in these areas, promoting collaborations that will develop into program-grant and center-grant applications.
- B. Provide support for existing faculty to make the riskier choice of submitting grant proposals to NCI, which has a low funding-success rate.
- C. Consider re-assessing programmatic strengths and areas for future investment/growth:
 - i. Cancer Immunotherapy is considered the future of cancer therapy in general. The increase of NIH and DoD funding designated for this area could be promoted at Upstate if strategic hiring decisions are made.
 - ii. Cancer Genomics comes with the tremendous acceleration of the knowledge about human genome alterations in cancer including actionable information on therapy resistance. Upstate cancer research would greatly benefit from hiring in this area.
 - iii. Hematologic Malignancies is an area with Upstate clinical expertise, but currently lacking staffing. Basic science collaborators (i.e. M. Karimi) are limited. There is an active portfolio of clinical trials in transplant for myeloma and lymphoma, and Upstate has the capability to expand into a regional leukemia center.
 - iv. Lung Cancer has a strong clinical trial portfolio at Upstate, but lacks basic science and translational research.
 - v. Neuro-Oncology is a developing program built on recent hires.
- D. Philanthropy: A very generous benefactor(s) (\$100+ million?) needs to be identified by the administration to put a bona fide cancer research institute on the map at Upstate.
- E. Clinical Research Goals:
 - i. Offer a broad portfolio of clinical trials for all common cancer diagnoses and stages of disease.
 - ii. Continue to offer patients cutting-edge treatments with seamless management of regulatory, budget/contract, and clinical care components.
 - iii. Double accrual to Cancer treatment trials, including specific goals of 1) accruing 20% of analytic cases to Cancer Clinical Trials (currently at 13%), and 2) growing the portfolio of investigator-initiated trials with basic science correlates.

10. Additional

Current Limitations: The current model of new CC faculty hires having their primary appointment in a “to be determined” basic/clinical department is not efficient or conducive to building a cohesive research program. This approach also creates tension amongst existing faculty with no interest in cancer in these biology departments, and may be inconsistent with existing departmental teaching missions. The hires recruited via this mechanism have not been particularly successful in acquiring NCI funding to date. Additionally, the ability to apply for some important sources of funding (i.e., training grants) is greatly hindered by the lack of accessible, reliable institutional research data. We are currently unable to obtain the data needed to complete grant application data tables, and likewise unable to demonstrate verifiable outcomes and successes relative to current research education initiatives.

Recommendation 1: Give the CC director control of a new (real, not virtual) cancer biology department or institute, with hiring and firing power, into which she/he can recruit their own researchers and let the director fully manage/coordinate their research activities to enhance chances of extramural cancer grant funding and drive collaborative projects between scientists and clinicians.

Recommendation 2: The director could recruit primarily term appointment researchers (Institute model) rather than tenure-track faculty (no teaching responsibilities or long-term fatigue/apathy). They would be provided with sufficient start-up resources but would be soft money appointments (rolling three- to five-year contracts), with renewal dependent on productivity and continued funding to support their salaries.

Recommendation 3: To promote clinician involvement in research (beyond clinical trials), recruit physicians into the new Institute/Department with a primary focus on wet lab research (e.g., MD/PhDs) (at minimum 50% effort, but preferably higher devoted to research and supported by grants).

Recommendation 4: Graduate student recruitment needs to be reevaluated. It is the life blood of most research labs at Upstate, including those interested in cancer research. There is a mismatch between number of students recruited and the needs of funded labs. A focused, strategic plan/initiative is needed to expand the graduate student pool and improve the quality of accepted candidates. Perhaps a separate graduate program in cancer?

Recommendation 5: Improve recruitment of postdocs, who serve as the major work force and source of productivity for established investigators.

Recommendation 6: Establish an Office of Institutional Research to coordinate the collection, analysis, reporting, and central repository of institutional data. In addition, develop a data governance framework to promote a culture that values institutional data, one that ensures access to secure, reliable data for data-driven decision making.

CLINICAL RESEARCH WORKING GROUP REPORT

(Gennady Bratslavsky-Chair, George Fulk, Karen Klingman, Corey McGraw, Kris Paolino, Mary Lou Watson, Ruth Weinstock, Beth Wells) with input from numerous clinicians, investigators, translational researchers and clinical coordinators.

1. The following is a concise narrative describing current strengths and capabilities

- A) CRU: supports outpatient research for faculty from all departments. Located in the IHP, there are 10 exam rooms, two laboratories, basic equipment, and rooms for monitoring. It is staffed by dedicated research nurses, a lab technician/CRA and a research NP. Weaknesses are described in the CRU subcommittee report.
- B) Cancer Center research consists of dedicated research team consisting of those with the knowledge of regulatory requirements, budget, and several CRAs covering studies in medical oncology, radiation oncology, and urology.
- C) Global Health research at Community campus: inpatient research capabilities; planned outpatient studies starting late 2020.
- D) Department of urology has been conducting clinical trial visits at their location at 550 Harrison.
- E) CRE is a strength, but its capabilities are limited due to few statisticians/epidemiologists and limited resources.
- F) EPIC EMR is a strength, but there is limited support for using EPIC for research. Availability of Redcap is also a strength, but it is not integrated with EPIC.
- G) Cancer Center offers organized clinical infrastructure to offer numerous and growing number of cancer trials. The team operates as a unit with much cross-cover and help across departments. Weaknesses include lack of centralized institutional commitment of research nurses as well as less competitive pay structures. A list of technical capabilities, both through personnel expertise and specialized instrumentation and facilities are listed in attached document.

2. A concise narrative on impediments for clinicians to engage in clinical research

- A) Lack of protected time
- B) Lack of salary support for research

- C) Paucity of experienced mentors
- D) Lack of training programs
- E) Lack of a CTSA/Limited infrastructure for clinical research
- F) Clinical data in many areas are not mineable — researchers have no access to the data
- G) No standard outcome measures across related departments
- H) Epic should have PROMIS (Patient reported outcomes) instruments embedded but our version of Epic seems to be missing them.
- I) IRB barriers for students and collaborators outside Upstate to be involved in research — need to get voluntary status
- J) Often the clinicians other than MDs or DOs (PT, OT, ST, etc.) have not been invited. They are unsure of how to do research, but would want to participate. For most clinicians, the idea of a full research project from start to finish is overwhelming.
- K) Lack of support at multiple levels of the institution for clinicians to participate (middle and upper management). If part of the mission of Upstate is to “improve the health of the communities we serve through education, biomedical research and patient care,” then this should be embraced at all levels of the institution, not just by those whose main focus is “research”.
- L) Lack of potential subject/participant database

3. Develop a strategy to incentivize participation of Upstate faculty in clinical research and to incentivize chairs to encourage participation of their faculty in clinical research

- A) Need formula for faculty salaries as most departments do not incentivize participation in research.
- B) Need to protect salary of faculty who want to participate in research but face a reduction in salary as protected time is rare.
- C) Need for seed funding and resources in project management, research assistants etc.
- D) Need for clear expectations/requirements for research participation/collaboration for purposes of annual evaluations and tenure/promotion.
- E) Need for a designated time to discuss ideas/current work/updates about research in faculty meetings or retreats on a regular basis (quarterly/semi-annually/annually).

- F) Need for improved ability to collaborate among researchers and clinicians across departments via formal and informal mechanisms for faculty across departments to meet, discuss and brainstorm research ideas.
- G) Need for discretionary awards/raises using grant funding to pay for time of the therapists and other clinicians.
- H) Hire research clinicians in key clinical areas across the institution whose primary responsibilities would be to facilitate research initiated by both clinicians (including those who are not physicians) and research faculty.
- I) Hire research support personnel (assist with managing budget, recruitment, etc.) across departments
- J) Develop a strategy to mentor young clinical faculty, fellows, residents and students in clinical research.
- K) A long-term goal is to submit a CTSA application. Most CTSA's have training programs - TL1 and KL2 programs that focus on the education of pre- and postdoctoral trainees, and on the career development of early-career translational researchers respectively.
- L) Develop programs offering certificates or master's degrees in clinical research.
- M) Hire more potential clinical research mentors as there is a paucity at Upstate of potential mentors in clinical research.

4. A draft strategy to address health equity research as part of the portfolio in the focus area. One work group member will be designated as the responsible party for developing this strategy. Chief Diversity Officer Dr. Daryll Dykes is willing to serve as a resource to assist with this plan.

- A) Provide an internal process/checklist that requires disparities to be considered as part of grant application process and specific aims.
- B) Provide a template with wording to include in all parts of grant applications ensuring disparities are at least considered (or why they are not).
- C) Provide resources to inform researchers regarding disparity issues (e.g., exemplar publications, databases, etc.). Include access to Census and other big data sets that typically characterize populations. Include rurality as a characteristic.
- D) Provide an appropriate REDCap questionnaire to capture appropriate disparate demographics and other subject features.
- E) Guide potential researchers to key illustrative studies/analyses/publications that could encourage similar approaches.

- F) Provide access to Upstate/SUNY collaborators who can serve on study teams to ensure disparities properly addressed.
- G) Provide access to potential colleagues who can provide expertise in qualitative methods as well to ensure key aspects of disparities are explored as part of studies.
- H) Collaborate with underserved and diverse populations in Syracuse to understand their needs and develop research questions based on this.

5. Develop a plan to increase the number of well-trained clinical research coordinators in Central New York.

- A) Develop educational (degree or certificate) programs at Upstate or partner with colleges that offer A-Z training in concepts of clinical research, regulatory and budget knowledge, with “on the job” training as an option.
- B) Increase awareness of potential future opportunities for clinical research coordinators in their ability to work on large cooperative studies or for big pharma.
- C) Develop summer programs with local colleges to allow for formal volunteering or stipend experience and immersion in clinical research as trainees under clinical research coordinators.
- D) Tap into existing administrative assistants, MOAs, LPNs and RNs in local hospitals and offices with interests in research and opportunities for “on the job” training.

6. Describe strategies to better engage and enroll Upstate’s patient populations in clinical research studies. The following is gathered from interviews with investigators, research coordinators, and research participants.

- A) Add to consent form template language that allows future contact for additional studies.
- B) Allow for access to EMRs with a field that says “patients willing to be contacted for future studies.”
- C) Allow/provide access to databases that allow researchers to post to general public availability study participation (Research match?) and training/support for using these.
- D) Train and involve (or hire) community liaisons for potential study subjects, especially those who are typically underrepresented or underserved.
- E) Collaborate with community groups to understand their health needs and develop research based on this.
- F) Develop relationship building with Upstate patients as there is a lack of trust between Upstate as an institution and the community, including a systematic racism.

- G) Overcome historical mistakes, ongoing threats to trust-building (which may not be sufficiently addressed) and systemic racism at many levels including the day-to-day interactions patients experience within upstate services.
- H) Identify Institutional policies that could perpetuate systematic bias including racism.
- I) Improve approach to research participants:
 - a. Address the view of participants as experimental subjects from which something can be gained (for the investigator, for the project, for the institution) with a lack of enduring reciprocity.
 - b. Participants have expressed that they feel abandoned after a research project ends. Results of the project are never communicated to the participant.
- J) Address gaps in communications between investigators and participants by creating educational opportunities for investigators to learn how to improve communication with participants avoiding medical jargon.
- K) Hire, support, and promote investigators who reflect the community.
- L) Improve community engagement:
 - a. durable, comprehensive engagement in the community that transcends any one research project is lacking.
 - b. engaging community members with similar backgrounds, educational levels, and experiences as the primary outreach mechanism.
- M) Resolve participant access issues for participants and caregivers who are not available during traditional work hours by offering after hours and weekend hours.
- N) Improve access to a wider geographic region via expansion and the use of telemedicine capabilities, training research staff in telemedicine skills, and installation of technology where needed.

7. Identify missing capabilities, facilities, instrumentation, and tools such as software and databases that would help drive more success in the clinical research arena. IT support for use of Epic data for clinical research.

- A) Expanded (human) resources for CRE, including a deployable set of analysts that can be hired by departments.

- B) Stronger support for CRE to better support study design and analysis throughout the institution.
Specifically:
- a. Biostatisticians (formally trained)
 - b. Methodologists more generally (not just quantitative or biostats)
 - c. Data base designers/programmers
- C) Generalist support (light analysis, Redcap management, data management, literature search and editing)
- D) PhD in Health Services Research or similar (Alternatively, a DrPH program)
- E) A mentoring program for clinicians in research methods up to and including master's program or other formal training for clinicians (we waste a lot of time explaining study design, or correcting mistakes)
- F) Need for more informatics and analytics support for clinical research
- G) Need for a better access to EMRs (Epic) for descriptive studies and potential study participation without need to access PHI (and need for IRB)
- H) Need a database of potential study subjects - i.e., those who have already participated and may have agreed (on prior informed consent) to be contacted further
- I) Need for a database of PIs and study titles/topics
- J) Need for a database of available equipment that can be used for assessment of research participants (e.g., who has what devices and bench equipment that we might be able to share?)
- K) Need for Certificate program and master's program in clinical research. Not sure where to house (Public Health?)
- L) Need for a database of faculty research interests to facilitate research across departments
- M) Develop a mechanism where every patient who comes to Upstate is offered opportunity to participate in research and, if they are willing, to be listed in a database (organized by diagnosis) whereby researchers could search the database and reach out to prospective participants.
- N) Hire clinical researcher in key clinical departments whose primary responsibilities is to facilitate research.
- O) Develop common data set (outcomes taken) across patients and departments.
- P) Develop tools for use of EMR for research.

9. Describe five aspirational goals in your area that could be achieved in the next 5- 10 years. These could include center grants, program project grants, large instrumentation grants, training grants, national/international recognitions, Howard Hughes Investigator, CTSA application etc.

- A) Submit and secure Clinical and Translational Science Awards (CTSA). It will also have the
 - a. KL2 program for formal research training experience to scholars who already have an M.D., Ph.D. or equivalent doctoral degree as well as TL1 for predoctoral trainees.
- B) Commit institutional resources and support the hire of the Howard Hughes investigator from the outside as well as commit resources and support Upstate-grown Howard Hughes Investigator
- C) Fund and support submission of the application for making Upstate an NCI-designated Cancer Center.
- D) Develop premier core in digital pathology and biobanking that would span across multiple disciplines and subspecialties with strong integration of inside researchers, outside collaborators and pharma.
- E) Obtain a large instrument grant or sponsor an acquisition of 7T MRI for both clinical care and research as well as a cyclotron for generation of radionuclear pharmaceuticals for modern diagnosis, theranostics and research.

REPORT OF THE SUB-COMMITTEE ON THE FUTURE FOCUS AND CAPABILITIES OF THE CLINICAL RESEARCH UNIT

INTRODUCTION:

The Clinical Research Unit (CRU), located on the first floor of the Institute for Human Performance (IHP), is an Upstate Medical University supported specialized core facility dedicated to conducting outpatient clinical research funded by government, industry, or not-for-profit foundations. Any member of the Upstate Medical University faculty may utilize the resources available at the CRU for implementation of clinical research protocols. All projects are approved by the Institutional Review Board for the Protection of Human Subjects (IRB).

The CRU is generally open Monday-Friday 7am to 4:30 pm. When needed, it is also open evenings and weekends. The Division of Infectious Diseases in Department of Medicine, has utilized weekend hours for some of their vaccine trials. The CRU budget includes 6.1 FTE research RNs. These nurses work for the hospital as assigned when not needed on the CRU. RNs are paid by University Hospital (including overtime for weekend hours for vaccination trial visits). The research support specialist/laboratory technician, laboratories research nurse practitioner and space are supported by Research Administration.

UTILIZATION:

In 2019-2020, investigators from the following departments used the CRU: Geriatrics (1 faculty), Medicine [Endocrinology, Diabetes and Metabolism (3 faculty), Infectious Diseases (4 faculty), Rheumatology (1 faculty)], Microbiology/Immunology (1 faculty), Neurology (6 faculty), OB/GYN (1 faculty) Orthopedic Surgery (1 faculty), Pediatrics (Endocrinology and Diabetes, 1 faculty), and Psychiatry (1 faculty). There were 1,656 study visits, some of which were quite brief and others lasting up to 12 hours. The most visits were conducted for studies in Geriatrics (135), Endocrinology, Diabetes and Metabolism (561), Infectious Diseases (747) and Neurology (129).

PI PERSPECTIVES:

Benefits:

- Research nurses are excellent, professional and treat participants with empathy and respect.
- Research laboratory services (laboratory technician, processing, storing and shipping of samples) are excellent.

- The CRU really has most everything needed to make any investigator successful. The focus is research, unlike clinics, which are much busier and less detail-oriented.
- Ability to conduct complicated and long assessments and procedures
- Ability to administer investigational products
- Space for monitoring visits Barriers:
- Clinical faculty need protected time. Time devoted to research takes time away from seeing patients and results in a significant reduction in salary.
- Location (in the IHP) is inconvenient (too far from patient care sites)
- Lack of training programs for trainees and inexperienced faculty
- Paucity of experienced mentors
- Training for research APP needed for specific procedures. For neurology and geriatrics research, lumbar puncture training was given as an example.
- Some new faculty report they were not aware of the CRU and services provided.
- Some faculty have need for CRA services (including part-time), including help with IRB/regulatory.
- Difficulty with participant recruitment for some studies
- Limited number of exam and procedure rooms, which need to be cleaned before and after each participant by a nurse, can restrict scheduling.
- Location not connected to the hospital (limits types of studies that can be performed safely and makes use of the research pharmacy logistically difficult)
- No inpatient capability (not in a hospital)
- No clerical support for registration, scheduling, billing (including required entries into the CTMA (Velos))
- Difficulty scheduling other needed ancillary services (e.g., imaging studies)

PLAN:

To increase the footprint and capacity of the CRU, the following are recommended: General:

- Include introduction to the CRU during faculty recruitment and orientation
- Recruitment of clinical researchers who can also serve as mentors and help establish training programs
- Improve visibility/access to CRU site on Upstate's research website Outpatient:
- Establish satellite CRU in the Nappi building
- Establish satellite site at either 550 Harrison or UHCC. This would facilitate collaborations with Ophthalmology, which has all its equipment at 550.
- Expand use of satellite site at Community (Global Health is already planning to do studies there - possibly others can use that site; a needs assessment should be performed to determine faculty interest).
- To facilitate the conduct of clinical trials for both new and established investigators, the CRU should employ a staff member who will register subjects when necessary, enter completed procedures into the CTMS (Velos) after each visit, work with study staff and CRU nurses to prepare visit orders, and schedule CRU appointments in EPIC.
- Have satellite research pharmacy or pharmacist services on site

Inpatient: The establishment of an inpatient research unit at the Community campus: Global Health uses inpatient beds on the sixth floor of Community to admit people as needed for their dengue fever study. It was proposed that designated hospital space on the Community campus be used for research (and for non-research patient care when not needed for research). This would permit additional studies to be conducted (e.g., 24 hour/multiday PK studies, additional inpatient vaccination (challenge) studies, and epilepsy studies by Neurology).

ASPIRATIONAL GOALS:

In 5-10 years, the goal is to submit a successful Clinical and Translational Science Award (CTSA application) to the NIH (UL1 and KL2 awards required). For the UL1 award the following are required: A. Administrative Core; B. Informatics; C. Community and Collaboration; D. Translational Endeavors; E. Research Methods; F. Hub Resource Capacity, G. Network Capacity. An Institutional Career Development Core (KL2), which supports early career postdocs and physicians, is also required. A TL1 award is optional (National Research Service Award Training Core to support translational research training for pre- and postdoctorates). See PAR-18-940 for further details.

REPORT OF THE EDUCATION RESEARCH WORKING GROUP

Task force members: Amy Caruso Brown, Lynn Cleary, Rachel Fabi, Lauren Germain, Rebecca Greenblatt, Andreas Meier, John Norcini, Bruce Searles, Tammy Austin-Ketch, Stephen Knohl, Chris Morley and Eric Olsen

Additional Internal Reviewers Who Provided Substantive Feedback: Seth Perry, Wendi Ackerman and Susan Wojcik

EXECUTIVE SUMMARY

The Educational Research Working Group met four times and worked both independently and collaboratively toward the completion of this report. Our findings indicate that there are many disparate areas of strength and potential throughout the organization that could serve to advance educational research at Upstate. However, there are three primary structures that would facilitate this endeavor: 1) strong academic data hygiene and governance, 2) adequate personnel and infrastructure, and 3) an organized approach. We believe that with these three things, Upstate could move to the cutting edge of research in health professions education, which would lead to gains in learner recruitment as well as faculty retention and satisfaction. We understand that the return on investment in educational research is different than the other types of research and that it often brings in less external funding (though several identified funding sources support projects in the six or seven figures). As such, the benefits of a robust educational research infrastructure are outlined in the introduction to this report.

I. IMPORTANCE OF EDUCATIONAL RESEARCH WITHIN ACADEMIC MEDICAL CENTERS

The value of research is often measured in the extent to which it is funded, or attracts funding, from outside entities. There are funders that provide extramural support to institutions for medical education research projects, but they often come with smaller overall budgets and lower or non-existent indirect cost capture.

There are, however, several downstream benefits to supporting a robust medical and health professions education research engine at Upstate. These investments may have less tangible and measurable, but nevertheless real, financial and operational benefits as well, often in the form of cost savings.

1. Accreditation processes are often approached as relatively last-minute data accumulation efforts, which end up costing thousands, hundreds of thousands, or millions of dollars to rectify. An active research mission may produce regular answers to questions that arise on accreditation and similar efforts, and which cost money to answer.
2. High level educational research can inform our practices, improving both our learning outcomes as well as student satisfaction. Active and rigorous monitoring (using research methods, as opposed to casual or reactive data collection) can offset downstream costs when the institution has to retroactively study and remediate problems such as Graduation Questionnaire and alumni survey issues, standardized test failures, issues in residency matching, etc. Robust and active medical education research can identify and correct problems before they become expensive to fix, and can serve an important Quality Assurance/Quality Improvement function.

3. Expanding support for medical education research can also increase the level of scholarship we see from faculty. Faculty focused on teaching or clinical practice as their primary duties may miss the opportunity to both think more deeply about their work, as well as to increase their publication and presentation output. This is often stressed in the form of studies or quality improvement in the clinical setting, but many faculty miss the opportunity to produce scholarship in education, simply because there are few examples, and little guidance, available. An education research infrastructure will also strengthen promotion and tenure processes by increasing scholarship opportunities for faculty, which will help to recruit and retain quality educators.

4. Additionally, creating pathways, visible support, and a broader mentorship pool may advance the culture of inquiry and scholarship at Upstate more broadly. This may increase research opportunities for students and residents as well.

II. CURRENT STATE

A. Strengths & Capabilities

1. Resources: SUNY Upstate enters this strategic planning process with substantial untapped potential for educational innovation. Upstate Medical University has a wide range of personnel expertise, facilities, and resources that could contribute to a strong education research program. Upstate possesses both the resources needed to generate data and the personnel expertise to analyze and apply the findings of research in the educational setting and beyond. Our campus has already established the following which support or stand to support educational research:

- a) education tracks for promotion
- b) an Academy of Educators
- c) support for relevant data collection and analysis software (including R, RedCap, SPSS, MedHub, B-Line, and Tableau)
- d) a health professions education journal club
- e) manikin and standardized patient-based simulation centers
- f) a new microcredentialing process
- g) Nanocourse infrastructure in the College of Graduate Studies, and
- h) centralized institutional support and data-gathering for our health professions education programs

2. Upstate as a site for education innovation, research and scholarship: Upstate is a potentially fruitful site for education research studies. We serve students, trainees, clinicians, scientists, and patients who represent a diverse cross-section of America, whether as researchers or subjects. Our programs are linked by a team working on interprofessional education as well as shared assessment spaces. We teach and serve throughout a network of training sites that further extend our reach, and several of these sites host outreach education for

additional learners who are not formally Upstate students (e.g., clinical professionals working to increase their capabilities through workshops). Our multiple degree programs create fertile ground for interprofessional collaboration and allow us to pilot innovations at multiple levels. Personnel in the Office of Evaluation, Assessment and Research, the Center for Research and Evaluation, the Moonshot Team and others have the analytical expertise necessary to move projects forward. Further, the faculty members in the library have a proven track record of supporting literature searches for best practices and existing scholarship.

3. Upstate faculty as educational innovators: Many faculty belong to national professional societies that support and publish scholarship and provide opportunities for networking and collaboration. Importantly, many Upstate teaching faculty have a pent-up desire to publish the results of their educational interventions, leaving many desktops perpetually hosting unfinished manuscripts and unanalyzed datasets.

In addition to potential projects and development, the faculty and staff at SUNY Upstate currently include some experts who mentor and support the development of others. Andreas Meier from the Surgery department is currently part of a multi-institutional Stemmler Fund project (one of the preeminent awards in health professions education). Upstate is home to one of the nation's leading experts on diversity and inclusion in medical education, Amy Caruso-Brown. Lynn Cleary, Vice President for Academic Affairs recently won the Robert J. Glaser Distinguished Teacher Award, a significant award in medical education. In addition, John Norcini provides master expertise through decades of educational research at the national and international levels.

There is likely educational innovation happening in every Upstate degree and residency program, but there are often too few organized resources to turn these projects into meaningful scholarship that would allow the faculty to have a larger impact on their professional communities.

4. Partnerships and potential: Upstate is also well-positioned to support educational research that benefits underserved patient populations; historically marginalized learners, faculty, and staff; and global partners.

Personnel with expertise in the needs of underserved communities include faculty and staff with ties to Native American communities, migrant farmworkers, refugees, the homeless population and more. Upstate also has global partnerships that can provide opportunities for education research on a global scale, including with Maseno University in Kisumu, Kenya. This partnership presents an opportunity to study the impact of global health education and exchange on U.S. and Kenyan learners and space for comparative research while encouraging bi-directional exchange. Other global partnerships exist in Thailand and Ecuador as well, and Upstate is also home to a new Global Health MPH program. Project ECHO and the evolving collaborative online international education (COIL)/virtual exchange activities/programs that Seth Perry is developing also have great potential. This wealth of relationships and knowledge position the university to support educational research to promote the wellbeing of these communities as well as fostering relationships between learners and the people who live in central New York.

Additionally, the university has a number of local partnerships that can facilitate educational opportunities and research. Locally, Upstate has access to Syracuse University, which presents a number of possibilities for improving education research. The SU School of Education's program in Instructional Design, Development and Evaluation and their Graduate program in College Science teaching in the College of Arts and Sciences

can serve as resources for education graduate students and faculty members who could collaborate on educational research with Upstate Faculty. SU could also serve as a pathway for Upstate faculty pursuing training and/or degrees in education, which may also be supported by UUP/SUNY credits for faculty. Additionally, the SU Theater Department is a source of Standardized Patients for the Clinical Skills Center (see below)

5. Infrastructure: Another key set of assets are the facilities and infrastructure needed to support experimental and quasi-experimental educational research. These key facilities include the Clinical Skills Center and the Simulation Center, both of which facilitate learning that can be safely tailored to encourage experimental education design. The expertise of Eric Rufa, Director of the Simulation Center, is a significant asset for using these facilities to their full potential. Upstate's telehealth infrastructure could also support educational research, especially for learners in remote settings. Further, UUP awards educational and professional development grants that could be used to offset costs. UUP will support one course per semester at a SUNY institution.

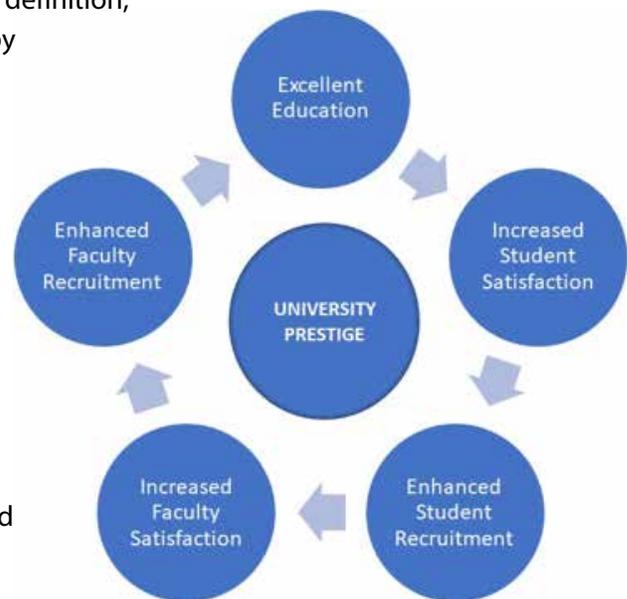
III. ASPIRATIONAL NARRATIVE & VISION FOR EDUCATIONAL RESEARCH AT UPSTATE

A. Introduction & Vision

A climate of excellence in healthcare education is a critical component of the virtuous cycle in which student satisfaction, new student recruitment, faculty satisfaction, University reputation, new faculty recruitment, and excellent student education all feed one another. Small-dollar health science education grants and awards should be viewed as accelerants of this cycle, not as substitutes for institutional support. Building wisely on existing resources and expertise, Upstate could become a significant player in health professions innovation and scholarship in the next 5-10 years.

Historically, scholarship in the context of the university has included teaching, research, and service. Despite this expansive definition, in the recent past it had been judged predominantly by research and publication. In a special report to the Carnegie Foundation on the priorities of the professoriate (1990), Boyer offered a re-expansion of the view of scholarship to include four types:

1. The scholarship of discovery (research);
2. The scholarship of integration (e.g., interprofessional education);
3. The scholarship of application (e.g., service to the community broadly defined); and
4. The scholarship of teaching and learning.



Boyer's model has been embraced in the health professions and is aligned with our recommendation to integrate scholarship in its various forms into the university's strategic research plan.

As an academic medical center with a mission to improve the health of the communities we serve through education, biomedical research and patient care, we aspire to advance educational research and scholarship to contribute to that mission.

Vision: Our vision for educational research at Upstate is to establish a strong culture and practice of research and scholarship in health professions education and to build an infrastructure that supports it. We aspire to contribute to research about the relationship between educational outcomes and patient care outcomes, as well as research in areas proximate to outcomes, including processes of education and learning.

Goals & Metrics: The following goals further articulate that vision:

- a. Foster educational scholarship spanning Ernest Boyer's four categories
 - i. Process Outcome: Build a mechanism to track educational research productivity into the established AAE process
 - ii. Impact: Increase overall number of scholarly contributions by Upstate faculty members
 - iii. Key personnel: AAE administrators, Department Chairs, Promotion and Tenure committees
- b. Create/support a community of practice in education research and scholarship
 - i. Process Outcome: Infrastructure built to support community of practice (e.g., meetings, trainings, etc.), recruitment/retention of innovative teaching faculty
 - ii. Key personnel: Academy of Upstate Educators, Office of Faculty Affairs
- c. Enhance professional satisfaction of faculty and staff through educational research and scholarship
 - i. Impact: Increased job satisfaction among teaching faculty as measured by surveys administered through Faculty Affairs
- d. Provide opportunities for learners to collaborate with faculty and staff in educational research and scholarship
 - i. Process Outcome: Additional student/faculty education research partnerships
 - ii. Key personnel: Office of Medical Student Research (maintain the list of opportunities for student research¹), faculty who oversee education electives, departmental graduate student advisors

C. Capacity Building: Resources & Infrastructure

1. Create an Academic Data Warehouse — Core educational data (process and outcome data as well as NYS patient data and other forms of data) in a centralized database

Currently, inadequate data management and hygiene present a significant barrier to educational research at Upstate. The construction of an educational data warehouse, leveraging the strengths of the Moonshot team and the data currently residing within Upstate data systems, would allow the organization to glean insights essential to program improvement and drive future partnerships and innovations. A data warehouse, partnered with data governance and hygiene systems, could bring together data from all aspects* of all of Upstate's educational programs.** If designed well, the warehouse should serve multiple purposes, including supporting university operations.

For a useful model, see NYU's work on Education Data and Advanced Analytics

*admissions, assessments, interventions, patient outcomes, etc.

**undergraduate, graduate, post graduate, faculty development, and outreach

2. Remove/Offset disincentive, align incentives for education scholarship and educational innovation among clinicians and basic scientists

By establishing an education track for promotion, Upstate has taken a critical first step toward incentivizing education research and innovation by faculty. The existing track should be reviewed, strengthened, and made more consistent across the colleges. Subsequent steps should remove disincentives that continue to stunt our potential in this area. Faculty in general and clinicians specifically need adequate blocks of dedicated time to be creative. In final form, these blocks could be arranged during contract negotiations or annual reviews. As a first step, high-profile awards of protected time could be given to faculty who show outstanding skill or potential in education innovation.

3. Establish and maintain a small pool of funding for faculty development and travel to health professions education conferences

Collaboration and learning from others outside of Upstate is essential to stay at the cutting edge. As such, faculty will need to attend conferences and trainings with professional peers. A small pool of travel/training awards to be distributed annually by the academic deans could go far.

1 Consider how to best organize opportunities for students outside the MD program

IV. FUNDING TRENDS AND FORECAST

A. Upstate Five-year Trends

Over the past five years, faculty at Upstate have obtained a number of Health Resources & Services Administration (HRSA) training grants and small grants to support educational innovations. Funding sources include specialty specific sources (e.g., the Alliance for Academic Internal Medicine) and SUNY sources (e.g. Innovation Instruction Technology Grants). The Department of Surgery is part of a multi-institutional Stemmler grant.

College of Nursing: Over the FY16 - present period, the College of Nursing has secured more than \$8.5 million in extramural funding for projects and initiatives. Sixty-six percent of this funding had a direct association with educational research initiatives and opportunities. For some of these grant-funded initiatives, new faculty and dedicated staff positions were created specifically to support educational research within the department. Examples of this include a dedicated .4 FTE Data Specialist, 1.5 FTE of new faculty lines that support clinical and research initiatives, promotion of successful Nurse Practitioner didactic and clinical dedication, 2.0 FTE of dedicated grant support staff, and through extra service initiatives supported by grant funds, development of a wide variety of supplemental and sustainable didactic content that has been incorporated into existing programs for enhanced student experiences. This content has the potential to be developed into a sustainable microcredential program under new SUNY-wide initiatives. All of the funded projects have also incorporated critical collaboration both interprofessionally and with non- Upstate community-based partners which bring additional areas of expertise, important bridge relationships, and ongoing regional partnerships in areas of specialization that are not present internally.

B. Funding Forecast

1. Sources: A 2018 article published a table of opportunities that can be accessed here. In addition, small-dollar grants and awards for healthcare education are available through organizations including but not limited to:

- a. International
 - i. IAMSE (\$5,000)
- b. National
 - i. Health Resources & Services Administration (HRSA) (variable, some as much as \$500,000/ year)
 - ii. NBME Stemmler (Up to \$150,000 year)
 - iii. Robert Wood Johnson (Recent examples range from \$100,000-\$500,000)
 - iv. Macy (Board Grants awarded up to \$420,000)
 - v. Patient Centered Outcomes Research Institute
 - vi. NIH (SUNY Binghamton has an R-25 of \$299, 121)
 - vii. NSF (Innovations in STEM Graduate Education Grants can be in the millions)
 - viii. CARES act (Coronavirus Aid, Relief, and Economic Security (CARES) Act. Part of the CARES Act funding includes new and expanded grants that can be used for medical education and training, equipment and distance learning
 - ix. NLN (grants ranging from \$2,500 — \$30,000)
 - x. INACSL
 - xi. others
- c. Regional
 - i. NEGEA (up to \$15,000)
- d. Specialty Specific Education and Training Grants (variable)

2. Anticipated areas of funder interest: In the next 5 years, our working group anticipates the availability of grant funds directed to the following areas:

- a. Teaching about social determinants of health
- b. Interprofessional Education
- c. Diversifying the pipelines to health professions
- d. Rural health care
- e. Telemedicine / remote education
- f. Mental health education and workforce development
- g. Handoffs and transitions of care
- h. Linking educational outcomes to healthcare outcomes (e.g., in surgery, linking performance evals of chief residents to national malpractice suits)
- i. Provider/patient communication and patient education, especially when it involves improved health care outcomes

V. CAPACITY BUILDING: PERSONNEL

[new faculty or staff hires/adjustments that would amplify impact, fill missing expertise and create bridges to other areas of strength at Upstate]

There are two primary barriers to building educational research at Upstate: 1) navigating IRB processes and 2) data sourcing, hygiene and analysis. The following are needed to support gains in educational research:

1. 0.1 FTE in the Research Compliance office dedicated to supporting faculty, staff and students who are working on educational scholarship

Working group members and their colleagues describe frustration with navigating Upstate's IRB processes. The creation of a partial role dedicated to supporting educational research could: a) create a series of training tools to help faculty navigate common IRB questions (e.g., the use of exam data, the storage of learner data, etc.), and b) ensure consistent responses to questions posed by faculty.

2. 1 FTE dedicated to academic data hygiene and strategy situated in IMT or Academic Affairs

During our research for this report, working group members learned that on the academic side of the campus, "when someone creates a variable or requests a report, they are responsible for keeping the information about it (purpose, definitions, parameters, etc.). There is no formal process for this." The Registrar's Office, for example, has binders with papers that include data definitions and report parameters. Other individuals on campus have similar information memorized. If someone wishes to use existing data or reports, they must find the person responsible for requesting the original report and request their aid in interpreting them. This is not a sustainable system for data strategy in the 21st century. As a result, Upstate risks significant errors that can impact student outcomes (like residency placements), accreditation status and our ability to easily report on information to attain or maintain educational grants. 1 FTE dedicated to academic data hygiene and strategy would work across all colleges and programs to create a strategic approach to data management allowing stakeholders to easily gather and interpret reports.

3. .5 FTE Dedicated to Educational Research Innovative Design in Education Accelerator (IDEA) Lab (see V.1 below)

An IDEA Lab is a site for the facilitation of educational research projects. Organization and oversight of the Lab's functioning might include: a) sharing methodological and writing expertise, b) collecting and distributing funding and publication opportunities, c) connecting interested stakeholders with one another, d) creating training tools and models and e) facilitating workshops to build capacity.

4. One graduate research assistant

Typically, graduate students work about 20 weeks on projects related to educational research and work towards discovery and publication. A student from either the School of Education's program in Instructional Design, Development and Evaluation and their Graduate program in College Science teaching in the College of Arts and Sciences could be a major asset at a minor cost.

VI. STRATEGY TO ENGAGE, MENTOR AND BUILD COLLABORATIONS WITH CLINICIAN EDUCATORS AND EARLY CAREER FACULTY TO HELP TRANSLATE EDUCATION RESEARCH FINDINGS INTO EDUCATION PRACTICE

To support the goals outlined in our vision above, we recommend the establishment of a Center for Educational Innovation and Excellence that will include:

1. An IDEA Lab to support the process from ideas to execution (full description at link)
2. A Research Interest and Writing Group
3. An academic unit with faculty appointments (these would usually be secondary appointments but may include primary appointments)
4. A structured mentoring and professional development program
5. An annual Education Symposium to highlight work in educational scholarship
6. Collaboration to develop educational tracks within existing programs, and graduate level degree programs in education and educational leadership
7. Collaboration with IMT to establish strong institutional research infrastructure, data warehouses (within Upstate and to include NYS patient outcome data) and to engage the Moonshot team in academic/ educational projects
8. Strategic partnerships with industry that would foster innovation and facilitate the study of pedagogies and outcomes
9. An Educational Research grant review group, that would work collaboratively on, and help pre- peer review, proposals
10. All of the above would be facilitated by a rebuilt, social-science specific IRB process
11. The end result of this work flow would be recognized by committees for promotion and tenure

VII. STRATEGY TO ADDRESS EDUCATIONAL RESEARCH IN SOCIAL JUSTICE OR STRUCTURAL RACISM AS PART OF THE PORTFOLIO (AMY CARUSO BROWN)

A. Goals

Population	Target of Intervention		Comparison	Outcome
Learners	Strategies to promote recruitment and retention	Recruitment of learners from underrepresented minority (URM) groups	Historic data	Matriculation rates
		Retention of learners from underrepresented minority (URM) groups	Historic data	(1) Graduation rates (2) Rates of graduates matching at Upstate and/or accepting first positions at Upstate/in Syracuse community
	Curricular content addressing social justice, structural racism and related topics	Development and implementation of content	Pre/post intervention	(1) Knowledge, judged by academic performance in coursework, including (P)RIME assessment small group performance and script concordance testing (2) Skills, judged by performance in simulated cases (3) Skills, performance in clinical experiences (360-degree evaluation, including patient assessment) (4) Patient outcomes in residency (5) Post-training practice sites (e.g., seeing Medicaid patients, working in underserved areas, etc.)

Population	Target of Intervention	Comparison	Outcome	
		Review of existing content for bias	Change over time relative to uptake	(1) Uptake/adherence (2) Qualitative assessment of content change (3) Student perceptions of campus climate and learning environment
	Mitigating bias among learners	Bias in interactions with each other and future colleagues	Pre/post intervention	(1) Performance in simulated cases
		Bias in patient care	Pre/post intervention	(1) Performance in simulated cases
		Bias in evaluation and assessment of faculty	Pre/post intervention; faculty from different social groups	(1) Numeric scores on assessment scales (2) Analysis of language using in assessment, relative to social identities
Educators	Strategies to promote recruitment and retention	Recruitment of educators from underrepresented minority (URM) groups	Historic data	(1) Hiring rates

Population	Target of Intervention	Comparison	Outcome
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		Promotion of educators from underrepresented minority (URM) groups	Historic data	(1) Promotion rates
		Retention of educators from underrepresented minority (URM) groups	Historic data	(1) How long faculty stay once hired (2) Why they leave (3) Where they go
	Teaching skills	Innovative pedagogical approaches	Pre/post	Will vary, likely some combination of knowledge and skill assessment
		Small group facilitation skills	Pre/post	(1) Small group interaction quality
		Bedside/clinical teaching	Pre/post	
		Content expertise		
		Bias in assessment of learners	Pre/post intervention; faculty from	(1) Numeric scores on assessment scales

Population	Target of Intervention	Comparison	Outcome	
	Mitigating bias among educators		different social groups	(2) Analysis of language used in assessment, relative to social identities
		Bias in interactions with learners and others	Change over time	(1) Learner report on campus climate/learning environment (2) Reports of bias/mistreatment

B. Resources Needed

1. Personnel

- a. Additional support for the Office of Evaluation, Assessment and Research
- b. Funding for trained observers for qualitative data collection
- c. Lead researcher in each college; preferably new hires with protected time for scholarly focus in this area
- d. Protected time to support a Community of Practice to meet regularly and write together

2. Software

- a. DecisionSim (complex simulation software)
- b. NVivo (qualitative data analysis)

3. Other

- a. Institutional pilot grant program to support this type of work, which has little national funding available
- b. Ability to track long-term career outcomes for learners (beyond residency)
- c. Ability to track faculty hiring and retention

VIII. FIVE ASPIRATIONAL GOALS IN YOUR AREA THAT COULD BE ACHIEVED IN THE NEXT 5-10 YEARS. THESE COULD INCLUDE NUMBERS AND QUALITY OF PUBLICATIONS AND PRESENTATIONS, EDUCATION GRANTS, TRAINING GRANTS, NATIONAL/INTERNATIONAL RECOGNITIONS.

[There is a need for baseline measures to make these goals more concrete]

1. Increase publications and presentations related to educational research and scholarship
2. Increase grants related to educational research and scholarship
3. Increase recognition and awards for educational efforts
4. Increase professional satisfaction among participants in the Center for Educational Innovation and Excellence
5. Increase number of faculty hires and promotions linked to aspirations and production of educational research products

ENTREPRENEURSHIP AND INDUSTRY RELATIONS (E&IR) WORKING GROUP REPORT

Kathi Durdon, Chair; Christopher Neville, Eric Smith, Juntao Luo, Kelsey Moody, Matthew Mroz, Richard Uhlig, Steven Hanes, William Kerr, Eain Murphy, Doug Buerkle

INTRODUCTION:

The Upstate Research Strategic Plan seeks to implement changes to increase Upstate's intellectual property (IP) portfolio and engagement with companies that drive early innovation to the market. This represents a promising option for funding research outside the traditional federal funding model. The revenue potential both to support faculty research and support growth of research operations and the research portfolio is promising. The E&IR Working Group was tasked with the charge to develop solutions and strategy to achieve proposed goals.

The E&IR Working Group's first step was to understand current industry engagement. We surveyed faculty and students to: 1) gain an understanding of our current industry relations, 2) understand how best to deepen those relationships and 3) how to form new impactful relationships. Faculty and students who indicated they were working with industry identified engagement in the following ways; speaking engagements, grant partnerships, material transfer agreements, bringing innovation to market, and through consulting arrangements. The identified reasons for not working with industry included: not knowing who the industry contacts were or how to make connections, lack of interest, lack of time, and an environment that was "too punitive." Also remarked was that Upstate's restrictive policies were developed due to a culture where industry was considered "unethical."

There were only a few industry partner survey respondents and they were primarily involved with universities through business development and education. To develop lasting relationships, industry respondents said that universities needed "clean partnership and contract agreements" and a nimble Tech Transfer Office. To that end, industry partners would like to see flexible and reasonable licensing agreements, clear non-disclosure and intellectual property agreements, and upper management support. They also commented that overhead was too high and key inventors were not willing to fully commit to startup generation or relinquish control. One of our working group members had conducted their own industry-level survey previously that presented the following persistent partnership gaps when working with universities:

- Limited/no availability of proof-of-concept funding
- Lack of business expertise and/or access to entrepreneurs
- Poor understanding of holistic customer needs
- Misalignment between universities and industry (objectives, risk tolerance, etc.)
- High risk/Low technology readiness level of university technology

- Limited time and awareness of industrial contacts hindering proactive marketing/business development (Tech Transfer Offices)
- PI interest (conflict of Interest rules)

One barrier mentioned in our survey responses included confusion about Upstate's Conflict of Interest (COI) process. During this working group process we met with Upstate COI officers who agreed to combine the three existing COI-related policies into one policy and implement a one-stop shop with a single point of contact, combined review committee, decision tree and interactive form. There are, however, several additional barriers to overcome at Upstate, such as the lack of entrepreneurial human capital:

- Limited postdocs who often are the drivers moving technology out of the lab (e.g., must target faculty or graduate students)
- Lack of interest and empowerment (cultural legacy of anti-entrepreneurship)
- Entrepreneurship not included in tenure process
- Current process for entrepreneurship is unclear (e.g., tech transfer)
- Fee-for-service or contract work issues with SUNY Upstate as non-profit tax exempt and need to define sponsored research rates ad hoc
- Lack of start-up funding support
- Limited venues to present ideas and attract investment

This report provides recommendations to sustain an Upstate entrepreneurial culture and advance industry relationships with strategic pathways for involvement and innovation.

UPSTATE ENTREPRENEURSHIP

We define "entrepreneurship" as student or faculty-initiated business activities that aim to commercialize one or more techniques, methodologies, or technologies. The scope of Upstate Entrepreneurship is distinct from other commercialization initiatives in that the focus is on promoting student and faculty-initiated business activities, as compared to sponsored research, out licensing, etc. There are two main categories of activities existing at SUNY Upstate that form the basis of a viable business: 1) Novel Technology: student or faculty-initiated technology that is patentable and, 2) Contract Research Services – technical know-how that can be sold as fee-for-service.

To support and sustain Upstate Entrepreneurship, we must provide incentives for faculty and student involvement and invest in resources to support these endeavors, inclusive of wet laboratory facilities. Effective use of wet lab space within Upstate needs to be strategic based on entrepreneurship goals. Upstate's incubator, CNYBAC hosts seven wet labs but is currently full with clients seeking expansion space. By utilizing vacant or underutilized laboratory space at the Institute of Human Performance (IHP) and existing faculty laboratories, we can support an Upstate Entrepreneurship footprint as an undeniable value proposition. The university will support faculty and student pathways to involvement and market and align with industry through product development and commercialization, licensing, internships, training, consultancy and funded fellowships for directed research and development.

PATHWAY TO INVOLVEMENT/PATHWAY TO MARKET

Upstate's intellectual property portfolio is a product of the university's research portfolio, which is largely comprised of federal research grants. On average, over the last five fiscal years Upstate's sponsored programs expenditures were \$33 million of which \$22 million or 64% were from federal sources and \$2.5 million were from industry partners.² From this research activity, the Upstate research community discloses an average of eight new inventions per year, with FY20 setting a five-year record of 12 new technology disclosures. While the numbers may change from year to year, the early stage nature of the inventions disclosed does not. A majority of technologies invented by Upstate faculty fall within the medical diagnostic and therapeutic sector. They are risky, costly to commercialize, and have a lengthy product-launch timeline. We need to de-risk transitioning the results of Upstate's research portfolio (i.e., innovation) into marketable products and services that transform and save lives. A key barrier limiting the growth of faculty and industry relationships is lack of an organized Pathway to Involvement/Pathway to Market. Fortunately, this is addressable with the following directed action items.

• ACTION ITEM 1. RAISE THE BRAND OF UPSTATE RESEARCH AND INNOVATION TO INTERNALLY IMPROVE A CULTURE OF ENTREPRENEURSHIP, AND EXTERNALLY TO ATTRACT AND ENHANCE INDUSTRY PARTNERSHIPS.

- o Enhance externally facing webpage to catalog and showcase unique expertise, equipment, and space.
 - Identify and describe in-house startups and licensing opportunities derived from Upstate intellectual property and broadcast sponsored research opportunities exploiting the unique skill sets of current faculty to specific industry targets.
 - Include statistics such as: number of patents, number of faculty/postdoc founders, amount of follow-on funding raised for each successful startup, jobs created, etc.
- o Leverage all media platforms to tell the story of Upstate research and innovation.
 - Create and distribute a slide deck and informational brochure to be sent to faculty, students and industry.
 - Establish an advertising campaign highlighting benefits of a Central NY technology hub, to possibly include Rochester, Rensselaer and Binghamton.
 - Share success stories, sharing industry partner collaborations via their social media.

• ACTION ITEM 2. INCENTIVIZE INNOVATION AND INDUSTRY ENGAGEMENT.

² See: Sponsored Programs Administration tab on the RF Systems Dashboard

- o Target the needs of Upstate innovators:
 - Provide faculty and students the tools and knowledge to understand the intellectual property disclosure process (e.g., mandatory IP 101 for new hires), how to engage with industry, and the support structures (i.e., people, technology, infrastructure) that exist related to industry engagement and innovation.

- ◊ Include entrepreneurship goals in tenure.
 - ◊ Galvanize alumni engagement as a key cornerstone providing mentorship, start-up founding interests, advisory board membership, consultant, investor, etc.
 - ◊ Allow utilization of faculty labs for entrepreneurial purposes.
 - ◊ Implement recognition programs for Upstate innovators and entrepreneurs (e.g., most promising inventor, first patent granted).
 - ◊ Host seed-fund award competitions.
- o Target the needs of industry to increase industry sponsored research engagement and enhance translational and applied research opportunities.
- ◊ Utilize the CNY Biotech Accelerator to promote business development, commercialization education, match services support, and startup partnership generation.
 - ◊ Proactively market Upstate's experimental capacity and ability to function as a CRO as well as other services available to industry.
 - ◊ Recruit faculty who align with industry pipeline targets, institute faculty positions that are co-shared with industry, and develop industry-supported fellowships.
 - ◊ Grow investment funding options with the potential for "first right of refusal."
 - ◊ Host an industry recruitment day.
- Action Item 3. Expedite transaction time with industry partners
 - o Communicate and make publicly available the process and procedures for engaging with industry to address "who is doing what by when" to get the engagement finalized.
 - o Adopt contracting models to accelerate the contracting process for industry sponsored research and intellectual property licensing.
 - o Produce a flowchart-styled resource page describing the steps needed to establish a successful working relationship with matched industry partners with separate "paths" to navigate the "gradient of involvement" outlined in the UIDP "Partnership Continuum" which includes awareness, involvement, support, sponsorship and strategic partner engagements.
 - Action Item 4. Invest in development of service-oriented resources and events.
 - o Launch Upstate Proof-of-Concept Program to support early stage technology development to de-risk early stage technology, encourage licensing and startup formation incorporating CNY Biotech Accelerator education, mentorship and expansive innovation ecosystem.

- o Implement an institutional resource for submission of SBIR/STTR based grants, maintaining a repository of redacted funded examples to educate existing faculty of the requirements for securing funding from these mechanisms.
- o Engage Central New York economic business development partner, CenterState CEO (CCEO) in initiatives to attract investment and government support.
- o Involve full-time technology transfer support on campus.
- o Partner with established university programs such as the SU Whitman School entrepreneurship programs to: involve students in industry collaborations, formalize curriculum to support student transition from trainee to industry track positions, provide resource support of engineering programs to meld with Upstate biomed strengths for ideation and product development.
- o Provide funding to support industry-driven projects, not basic research:
 - Internal grants of \$50,000 to \$100,000 to faculty or graduate student
 - Employ SUNY TAF and other commercialization programs in the ecosystem (internal to SUNY and beyond, see below)
 - Utilize CNYBAC assistance in location of additional funding opportunities.

SPONSORED RESEARCH	IP GENERATION	OUTREACH AND ENGAGEMENT	TECHNOLOGY MATURATION AND DEVELOPMENT		NEW VENTURE SUPPORT		IMPACT
Innovation	Disclosure, IP Assessment and Protection	★ SUNY TechConnect and Upstate Webpage	★ Upstate POC Program	SUNY TAF	SUNY Venture Advisors	SUNY Ventures, Inc.	PRODUCTS AND SERVICES
Contracting models	SUNY Inventor Portal, Inhouse patent counsel, technology assessment experts; business development resources	SUNY-wide platform for marketing technologies and startups	Upstate program to support technology development projects; SUNY TAF feeder	SUNY wide program	Experienced entrepreneurs to support startups and entrepreneurship	VC fund for SUNY-affiliated companies; pre-Series A, Series A	

ASPIRATIONAL GOALS

1. Upstate's award-winning postdoc program promotes technology transfer out of the university and provides career pathways for our graduates.
2. Best-in-class industry-partnered entrepreneurship programs showcase Upstate's strengths in discovery, therapeutic advancement and game-changing technology disruption, generating significant outside funding via SBIR/STTR mechanisms, increased patents, licensing and material transfer agreements.
3. Upstate's CRO services, CORE facilities, education programs and technology transfer fee- for-service operations expand offerings to facilities that lack support services.
4. Upstate invests a percentage of equity back into programming to purchase additional CORE equipment, build additional resources, and expand seed funding opportunities.
5. The CNY Biotech Accelerator expands to include a second facility for startup companies serving as the regional biomedical commercialization hub.

ENVIRONMENTAL HEALTH AND ENVIRONMENTAL MEDICINE

Saravanan Thangamani, Upstate; Chair, Chris Morley, Upstate; Margaret Formica, Upstate; Telisa M. Stewart, Upstate; Brian F. Leydet, ESF; Hyatt Green, ESF; Lee A. Newman, ESF; Mary B. Collins, ESF; Telisa M. Stewart, ESF; Maureen Fellows, ESF

A concise narrative describing current strengths and capabilities.

Summary: Our current strength includes faculty with diverse area of expertise in environmental and public health, microbiology and eco-epidemiology. Proximity to and relationship with SUNY ESF provides excellent opportunity to initiate innovative collaborative research programs that bridge environmental/ecology researchers and clinicians. The core facilities at Upstate and equipment availability at ESF are key strengths that has spurred innovation. In particular, the strategic recruitment of recent hires in Vector-borne infectious diseases area, and the construction of a vector biocontainment facility will advance Upstate's capacity to secure larger programmatic grants on emerging infectious diseases and will foster collaborative initiatives with ESF on the ecology of infectious diseases.

1. Center for Environmental Health and Medicine (CEHM) has a strong leader with excellent potential.
2. Proximity to and relationship with ESF is critical and should be leveraged.
3. The institution is filled with brilliant, incredibly motivated and hard-working people with diverse areas of expertise that can propel this area forward (population/public health, epidemiology/biostatistics, environmental health, microbiology, etc.), well-established labs and a Center that incorporates environmental health and is well-poised for further expansion, as well as established local/regional connections.
4. The core facilities and available equipment are an important Upstate strength that has spurred innovation.
5. Increasing strengths in VBDs. VBL will advance the Universities capabilities. Upstate's molecular biology core is an obvious strength. Upstate's ties to ESF bring a breadth of environmental experts (under one roof) that is unique when comparing other institutions where biology departments are small or are fractured by sub-disciplines.

Action items:

1. We cannot be a leader in all areas of environmental health and medicine. We have to focus on our current strengths and capitalize on them. With the recent hires and investment into CEHM and VBL, it is prudent to make additional investments (eco-epidemiologists, public health scientists, eco-modelers and research core facilities) to strengthen our capacity on environmental/ecological consequences on human health with a strong emphasis on vector-borne diseases.

2. Invest in new and innovative initiatives to foster research collaboration between Upstate and ESF faculties.
3. Lack of inter-departmental and inter-institutional collaboration is a major issue and it impedes innovation and progress. Each department works within its silo. Initiatives to create inter-departmental interactions/ collaborations must be established (a few of these are discussed below).

List of technical capabilities, both through personnel expertise and specialized instrumentation.

Summary: The expertise, core facilities and the biocontainment lab available to Upstate and ESF are complementary to facilitate research on environmental consequences on human health and emerging infectious diseases.

1. Bio-containment research within VBL. This provides the capacity to rapidly respond to any emerging infectious diseases, such as SARS CoV-2, and to attract research funds.
2. Diverse core facilities - Biostatistical core (CRE), molecular genomics core, DLAR, NMR, EM, Mass-spectrometry and environmental sample analysis core.
3. Faculty with diverse area of expertise – ecology of vector-borne diseases, infectious diseases, epidemiology, biostatistics, public/population health, environmental health, study design/analyses, multiple statistical software programs, geo-mapping, animal model development and ecology of infectious diseases.
4. Environmental and ecology researchers at ESF.

Action Items:

1. Additional support for molecular genomics core to hire dedicated staffs for bioinformatics, large scale data processing, whole genome assembly and technicians.
2. Investment into purchasing cutting-edge high throughput instrumentation to keep with the technological advancement in biomedical sciences.
3. Additional support for research administration to provide grant support.
4. Create histopathology core with a board-certified pathologist dedicated for research.
5. Hire dedicated (protected time) data scientists, biostatisticians to help analyze research data for publications and grant submissions.
6. Create a website with up-to-date information on existing expertise and core facilities.

Analyze funding trends over the last 5 years (data provided) and extrapolate to characterize opportunity space around future funding trends.

Summary: Overall, there is very little direct funding for environmental health and medicine. With the newly created CEHM and the recent hire to manage this center, there is a strong possibility to improve funding status in the next few years.

Current funding:

1. NIH R01 – Tick determinant of Powassan virus transmission (\$1.9 million, 5 years)
2. NIH-R01 – Efficacy of Rift Valley fever vaccine candidates (\$89,000, 1 year)
3. USDA - Ecological determinants of tick-borne disease transmission (\$120,000, 1 year)
4. DASNY – Tracking the emergence of tick and tick-borne diseases in New York (\$200,000, 1 year)
5. Tick-borne disease surveillance in Ecuador (\$15,000, 1 year)
6. Development of novel methods to control ticks (15,000, 1 year)
7. Environmental determinants of Parkinson’s disease (\$30,000, 1 year)

Future trend:

Aligning with the research priorities of CEHM, we anticipate submitting the following programmatic grants in the next couple of years. This is in addition to individual PI’s NIH/DCD/NSF grants.

1. NIH pre-doctoral T32 (or CDC or NSF) training grant for vector-borne zoonotic diseases with an emphasis on ecology/environmental impact.
2. NIH postdoctoral T31 (or CDC or NSF) training grant for vector-borne zoonotic diseases with an emphasis on ecology/environmental impact.
3. Obtain a NIH/NSF research grant for undergraduate training grants.
4. NIEHS multi-institutional grant with ESF
5. NIH P01 grant on tick (vector)-borne diseases.

Action items:

1. Invest in pilot and bridging grants, annually, to generate preliminary data.
2. Incentivize inter-departmental and inter-institutional grant applications/awards.
3. Additional support for research grant support staffs (pre- and post-award).

4. Incentivize collaborations between basic and clinical faculty on environmental consequences on human health.

A draft strategy to engage, mentor and build collaborations with early career faculty, fellows, residents and students.

Summary: Existing capabilities and strengths could be leveraged to mentor and advance early career faculty and fellows. However, there is a consensus that there are no standardized mentorship programs within the University or departments. The newly established CEHM is a strong mechanism for the advancement of opportunities, collaborations and mentorship.

Action items:

1. Coordination with departments to optimize both incentives for all stakeholders (each faculty member and each entity) for early career faculty is vital, and it is where these collaborative efforts often hit the hardest barriers.
2. Creating opportunities for fellows, residents and students will require expanding the number of faculty doing research. Projects led by early faculty, with student, resident and/or fellow involvement, will often be unfunded. If we wish to grow a culture of research, internal funding and/or recognition of small but meaningful unfunded projects must be valued.
3. Hold a summit/workshop bringing together established researchers with early career faculty, fellows and residents/students. The established can present their areas of expertise, work and opportunities for collaboration/mentoring, while others can bring ideas, interests. Include structured networking into summit. Will also foster collaboration among experienced researchers.

Descriptions of new faculty hires that would amplify impact in your area, fill missing expertise and create bridges to other areas of strength at Upstate

Summary: As a small institution, it is critical to know/identify our strengths and capability to build a powerhouse research program that will then lead to growth of other related research disciplines. With the newly created CEHM and the hiring of vector-borne infectious disease faculty, there is a consensus to invest in cluster-hiring faculty with research interests on vector-borne zoonotic infectious diseases with special emphasis on ecology and environmental impact.

Action items:

1. Investment into recruiting faculty with advanced geospatial analysis skill, with an interest and ability to apply them to environmental health and medicine problems.
2. Investment into recruiting an environmental virologist to help describe the vast unknown viral diversity within the population and the environment.

3. Investment into recruiting a computational biologist centered on metagenomic environmental data analysis.
4. Investment into recruiting a climate and eco-modeler focused on vector-borne diseases.
5. Investment into cluster-hiring vector-biology faculty (Mosquito-, tick-, flea-, sandfly-borne diseases).
6. Invest in hiring inter-institutional faculty that can bridge between Upstate and ESF.

Descriptions of new instrumentation and core expertise that would further empower current and future faculty for success:

Summary: Though Upstate's research infrastructure is good, there is a consensus that we still lack several core/expertise to address the changing needs (and advancement in methodologies) of research. Additionally, a general lack of inter-disciplinary and inter- departmental collaboration is observed.

Action items:

1. Investment into Geospatial analysis expertise
2. Additional resources put into public health/population health, center for research and evaluation
3. Additional resources put into Research admin for grant development
4. Additional investment into Molecular Genomics core, to keep up with the cutting-edge sequencing technologies and bioinformatics support for whole genome assembly (viruses) and technical staffs
5. Investment into an In-house gene sequencing capability
6. Dedicated (fully funded by University) bioinformatics, big-data scientist/s, and statisticians. We do not want a faculty with this expertise, as they would be more inclined to pursue research that is relevant to themselves and may reduce their effort to help another faculty.
7. Investment into IT infrastructure and data management for large databases
8. Investment into high-performance computing center
9. Investment into a medical illustrator expertise
10. Investment into major scientific software
11. Investment into subscriptions to major scientific journals
12. Work with SUNY system to synchronize major scientific software and journal subscriptions (this will probably bring the overall costs down)

13. Create a research histopathology core with a board-certified pathologist
14. Investment into creating a unified and up-to-date website for the research enterprise with an easy searchable database of faculty expertise, funded grants and core facilities
15. Investment into creating “faculty lounges” where faculty could freely discuss ideas that could foster interdisciplinary/departmental research
16. Incentivize inter-departmental collaborative research grants
17. Work with SUNY system to incentivize inter-SUNY institutional research activities
18. Invest into organizing symposia/conference within Upstate campuses
19. Provide funds to bring leading researchers/scientists to Upstate campus to give a lecture and to meeting with faculty/students

A draft strategy to engage, mentor and build collaborations with clinician scientists in your area in order to increase Upstate’s translational research portfolio.

Summary: Though Upstate has a strong representation in both basic and clinical research, the collaboration and synergy between these two are yet to be capitalized. Lack of protected time for clinical faculty has been identified as the primary reason for limited interactions between basic and clinical faculty.

Action items:

1. Capitalize on existing interests that overlap with key areas of environmental health. These include laboratory science, but are not exclusive to it. Access to better or worse environmental conditions are social processes, which can be informed by sociology, policy studies, economics, epidemiology, community health, and other disciplines from the social and population sciences. Many clinicians operate on the forefront not only of the biological exposure of humans-as-organisms, but also to the person in their context, and can be a conduit for vibrant collaborations with social scientists in pursuing answers to environmental health questions.
2. Hold a summit/workshop bringing together established researchers with early career faculty, fellows and residents/students. The established can present their areas of expertise, work and opportunities for collaboration/mentoring. Others can bring ideas, and interests (include structured networking into summit). The summit could be multi-part: initial part could be established researchers alone to break down silos, identify opportunities, then later summit to bring in early career faculty, students, etc.
3. Pilot grant program may improve this area and provide pilot data for grants. Subsidized clinical data collection costs for approved pilot studies.

4. Have a clinical faculty as a thesis advisory committee member for PhD students.
5. Invite basic science researchers to give grand round talks/seminars.
6. Plan on having research retreats between basic science and clinical departments.
7. Basic science researchers should get access to clinical lab services on a collaborative basis.

Provide a draft strategy to address health equity research as a part of the portfolio in the focus area. One work group member will be designated as the responsible party for developing this strategy.

1. Environmental health and health equity are linked in several vital ways. First, exposure to environmental risk factors for injury and disease is notably linked to social determinants of health. Segments of the population that have experienced discrimination, racism, oppression, increased rates of poverty are often forced, through both social and economic mechanisms, to live in closer proximity to areas of increased environmental degradation. Poorer neighborhoods often have higher rates of environmental risk, such as lead exposure or poor water contamination, and poorer individual may be at risk for occupational exposures to toxic chemicals. Conversely, wealthier communities tend to have access to more desirable living space, including lower exposure to undesirable environmental conditions, and more exposure to beneficial environmental factors, such as green space.

2. The consequences of environmental health inequity resonate across nearly all disease categories, including neoplastic conditions, chronic disease, acute injury and mental health. As such, environmental equity is a key component of health equity. A research strategic plan that encompasses an environmental component, and is serious about health equity, will incorporate not only laboratory-based assessments of chemicals and conditions, but also to the social context in which those conditions occur. These principles are recognized by the National Institute of Environmental Health Sciences (https://www.niehs.nih.gov/about/strategicplan/2018-2023_theme2/index.cfm), and encourage any capacity-building in environmental health to include those with research interests and expertise in public health, sociology, policy studies, health messaging, economics, and other social sciences to be engaged, recruited, and supported.

3. Hire faculty that focus on health disparities/health equity research; identify specific area for a program grant around health disparities (e.g., COVID, social determinants of health).

4. Luckily Environmental Health sets up well to tackle health equity research problems: Environmental Justice, Environmental Exposures (lead, air quality) etc.

Any additional initiatives and approaches that would move the needle in your area.

Summary: We recommend that the University identify a few research projects that have impacted and are a resource to local public health problems, and provide funding support or help identifying non-traditional mechanisms. These projects have a direct impact on the local health of the community, and also generate positive good will to the University.

1. There was a group working on health issues associated with I-81 rebuild/re-design with a goal of including health monitoring/research in funding from the State. Since COVID, that work seems to have stalled. This an area of opportunity for long-term research around environmental health and medicine.
2. Fund community-engaged tick and tick-borne disease surveillance program that offers free tick-testing services to everyone in the State of New York.

Describe five aspirational goals in your area that could be achieved in the next 5-10 years. These could include center grants, program project grants, large instrumentation grants, training grants, national/international recognitions, Howard Hughes Investigator, etc.:

Summary: Implementing the recommendations provided by the research strategic working groups are critical in achieving the following aspirational goals.

1. A Powerhouse in vector-borne diseases.
2. A national/international coordinating center for vector-borne diseases (WHO Collaborating center for vector-borne diseases)
3. NIH pre-doctoral T32 (or CDC or NSF) training grant for vector-borne zoonotic diseases with an emphasis on ecology/environmental impact.
4. NIH postdoctoral T31 (or CDC or NSF) training grant for vector-borne zoonotic diseases with an emphasis on ecology/environmental impact.
5. Grow public health/preventive medicine, etc. into a School of Public Health; secure a center grant and a training grant with a focus on environmental health
6. Obtain a NIH/NSF research grant for undergraduate training grants.
7. NIEHS multi-institutional grant with ESF
8. NIH P01 grant on tick (vector)-borne diseases.
9. Program grant that aligns lab, clinical, and social scientific aspects around a particular problem or region.
10. Research grants from Bill and Melinda or Gordon and Betty Moore foundations.

WORKING GROUP ON FACILITIES, TECHNOLOGY, AND OPERATIONS

Katie Keough – Chair Gina, McMahon - Co-Chair Wendi Ackerman, Ebbing DeJong, Marilyn Galimi, Dave Kiemle, Barry Knox, Matt Mahoney, Bob Quinn, Jennifer Rudes, Steven Taffet, Grace VanNortwick

Facilities

Upstate Medical University currently has sufficient space for the present researchers' needs, which includes bench, clinical research and the numerous departmental and institutional cores including:

- Center for Research and Evaluation (CRE)
- Clinical Research Unit (CRU)
- Department of Laboratory Animal Resources (DLAR)
- Flow Cytometry
- ImageXpress Micro Confocal High-Content Imaging System
- In Vivo Computed-Tomography
- Leica Center of Excellence in Advanced Light Imaging
- Molecular Analysis Core (SUNYMAC)
- Molecular Interaction and Drug Screening
- Musculoskeletal
- Proteomics and Mass Spectrometry
- Vector Biocontainment Laboratory (VBL)

However, one of the challenges is the existing disparity within the facilities across the various locations. Fortunately, there is available space for growth, but this requires significant renovation. The adequacy of the space will be assessed once the strategic priorities are identified.

Weiskotten Hall dates back to 1936 and provides one of the largest footprints at over 85,000 square feet. The drawback for this location is the aging infrastructure. However, the university identified this location as one of the priorities for renovations and completed a Master Facilities plan. Currently Upstate plans on investing in the building's electrical and mechanical systems to accommodate the use of the building. There is also a plan for the renovation of the animal lab DLAR located on the fourth floor, this renovation will modernize the space to meet the researchers' current and future needs. The next investment will be a phased approach to renovating the entire building in the next five years

In order to satisfy the aspirations to improve clinical and translational research to achieve an NCI designation for the Cancer Center, the clinical enterprise will need to be assessed and ensure a more inclusive planning process. Potential growth for the CRU will require additional space and consideration for proximity or relationship to the clinical areas. The aspiration of a 7T MRI will need to be carefully studied for an appropriate location to integrate clinical care and research. In addition, the BAC is at full capacity; therefore, growth for innovation and entrepreneurship to attract industry partnership will need further consideration.

Recommendations

1. Leadership should review the attached draft research space allocation standards, make any necessary modifications and approve the plan thus increasing transparency regarding the process.
2. Establish a research space planning committee to review the campus master plan and provide input as to research space needs in the next 5-10 years.
3. Invest in new cores that will benefit multiple research priority areas such as a computational core including: bioinformatics, shared computer cluster for data analysis and storage, Cloud and Linux support. Other cores recommended by almost all of the groups included an institutional biobank, an institutional data repository, and histology and electron microscopy.

The appendix includes the draft research space allocation standards and maps of the Institute for Human Performance (IHP) and the Neuroscience Research Building (NRB), New Academic Building (NAB), Weiskotten Hall and the Biotech Accelerator.

Technology

Technology crosses all the working groups. Services and resources must be aligned and unified under the Research Strategic Plan to reduce duplication of efforts and services. This will require building on the strong working relationship with IMT and all departments in Research. The investment in core technologies, network storage and bioinformatic computing will require the expertise and support from IMT to build an accessible, secure and reliable system. Accessing network shares is currently possible remotely and any new initiative developed under the strategic plan would support remote access to those services and be compliant with IMT security protocols. Building out these systems will address many of the IT related needs that labs currently lack or try to solve themselves. Taking away and solving this burden will allow labs to focus more on Research.

Recommendations

1. Accessing Networked Equipment/resources is currently possible but is not fully supported for any shared equipment/Core related functions. To ensure all research staff have remote capabilities it is important to purchase/work with IMT to ensure computers are setup properly to support this.
2. Establish a formal structure to utilize Microsoft Teams for each Research Department and for each lab. This can be used for collaboration efforts (document sharing, meetings and some file storage).
3. Establish a unit within IMT dedicated to research technology planning and support, including adding staff with Linux expertise.
4. Establish a Technology Onboarding Orientation/Manual for Faculty
 - o List available resources for new faculty and contact information for important services.
 - IMT/Physical Plant/Phones etc.
 - Software, how to purchase PC's
 - Library
 - Access to electronic resources
 - Using interlibrary loan
 - Using NYS Library collections

Wish List

- Robust Data Storage and sharing solutions are needed for data retention, sharing to meet funder requirements, and needs to be accessible when off campus. Data storage crosses paths with Bioinformatics IT needs (Computational core below)
- Data storage and sharing require intuitive interface(s) and support to ensure effective usage of these tools and platforms. Some options have a built-in interface and vendor support, others require a custom interface to be built and supported in-house.
- An organizational schema is needed, either a metadata solution or an easily browsable hierarchy, to make data retrievable by data owners and to facilitate data sharing.
- Implementation and support for policies, procedures, and best practices relative to research data management.
- Creation of a Computational Core to run analysis at scale, based on lab needs. Program must include structure on how funds are allocated and used per lab/department. Cloud solution is more scalable than building this onsite. Program management will be crucial toward the success of this project and could also be tied into the data storage solution at certain levels.
- Additional support for the training and effective use of research technologies

Operations

The goal of this operational assessment is to grow, enhance, and strengthen Upstate's infrastructure and organizational structure to support the Research Strategic Plan goals and a significant increase in research activity and funding. This includes identifying risks and providing recommendations to mitigate them and to improve the faculty experience in applying for and managing grant awards.

Research Development

The Research Development office's goal is to advance Upstate's research mission by supporting strategic initiatives both at Upstate and across SUNY (including coordinating the EIP proposals), identifying new funding opportunities, supporting proposal development through project management, preparation of templates and editing support. In addition, the office coordinates intramural pilot funding, limited submissions and nominations for external research awards/honors.

Risks

- The office currently consists of a director and a .4 FTE administrative assistant. Multiple committees identified the need for grant-writing support. In addition, committees identified the desire to obtain NIH training grants and to work toward CTSA and NCI designations. With the current staffing, it is not possible to provide the level of support needed to support these initiatives.
- Upstate is underutilizing tools that can support identifying internal collaborators and funding opportunities, committees identified providing support to finding internal collaborators as a priority.
- There is a lack of coordination between Research Administration and the Office of Graduate Studies, additional support that could be provided to students and postdocs is not being realized, including for training grants, fellowships and pipeline programs.
- Lack of data management policies, procedures, and support results in unnecessary steps, bottlenecks and risks for researchers at all phases of the research process. Issues surrounding research and institutional data practices contribute to inefficiencies relative to developing grant applications and working with data. Institutional and research data are at risk for data loss and insecurity, and the institution is at risk for non-compliance with funder requirements.
- Lack of research marketing, promotion and communication including social media.

Recommendations

1. Hire a fulltime grant writer to work with faculty on developing proposals.
2. Provide faculty and departmental staff with training related to the use of Pivot to identify collaborators and find funding opportunities and strategies to automate the notification process.

3. Integrate efforts between Research Administration and Graduate Studies to support students, postdocs and pipeline programs.
 - a. Create a working group to develop larger grants and develop synergistic strategies between the Research Office and Graduate Studies to spur grant submissions.
4. Implement and support institutional policies and relative to data storage, access, security, preservation, and sharing in consultation with IMT and library personnel.
5. Create an Office of Institutional Research for campus data and establish an institutional data governance program.
6. A research communications/events specialist position would address the need for visual dashboards, communication of events and awards, creation and maintenance of social media accounts, and annual reports and visualizations for grants and publications.

SPONSORED PROGRAMS PREAWARD & CLINICAL TRIALS

The most fundamental element of our complex research culture here at Upstate Medical University is the individual faculty member, whose intellectual talent and ambition drive the research enterprise. The Office for Sponsored Programs (OSP) complements our research culture by supporting our faculty and staff with a streamlined internal process and experienced, full-service administrators who aim to reduce the administrative burden on our faculty and allow them to focus on the “science” aspects of their grants, agreements or contracts. See Process Maps attached.

The primary risk identified for Pre-Award is lack of growth in the office to address increased volume, diversity of sponsors, and growing compliance requirements.

- The current structure of the office over the last 10 years has been a director (responsible for administrator role as well as higher level director deliverables), two research administrators (grants, contracts, agreements, modifications) and an office assistant. Upstate has an expanding portfolio of extramural sponsors requiring a high level of review and interpretation for timely, compliant applications. Additionally, the staff have a diverse/broad array of work responsibilities related to grants, research/clinical agreements and federal contracts. Attention needs to be given to broader functions, such as staff and faculty training across campus. Adequate staffing levels (credentialed, educated, high-level administrators) are critical to maintain and support the level of service required to meet the projected research growth set forth by leadership (including professional development), compliance monitoring, reporting metrics and faculty communication/education in support of research.

Additional Risks

- Limited support for larger center grants, training grants or other multi/cross disciplinary grants/projects
- Inadequate staffing in the office increases the risk for errors, oversights/omissions on review of applications, guidance review/interpretation, missed deadlines and non-compliance.
- Pressure related to maintaining turnaround times for contracts and agreements increases risk for oversight on high-risk language and expedited signatories.
- Need for more oversight and training on hot button items such as foreign involvement in research, export controls, conflict of interest disclosures, policies for trainings (FCOI, Responsible Conduct of Research).

Recommendations:

1. Grow the OSP - Pre-Award office from two research administrators to three administrators by 2021/2022.
2. Implement a robust faculty development and a training program for departmental staff to keep current on sponsor trends, changing policies/procedures, updated forms, and other best practices.

Post-Award and Upstate Administrative Offices

The Post-Award and Research Accounting Office, Campus Purchasing, Accounts Payable, Payroll and Human Resources departments are all committed to assisting our research faculty to help reduce administrative burdens, reduce transactional risks, resolve issues, provide recommendations, and maintain a close working relationship to ensure consistency and efficiency in all transactional processing. Our objective is to continue to develop and maintain an infrastructure that supports Upstate's research strategic goal of growing sponsored research. We need to continue to support our researchers by continually developing better tools and systems to streamline processes for efficiencies. In order to achieve that goal, we need the resources and support from leadership. In order to continue to support faculty and a growing portfolio there are certain higher priority operational needs:

Risks

- PI's find the Oracle system difficult to navigate. It requires a separate login and is not intuitive. Faculty are responsible for the financial management of their awards and if the systems are not easy to use, we are at risk of being out of compliance with sponsor guidelines.
- PI's are not fully aware of the RF and Upstate policies and procedures included those related to employee relations charged to sponsored awards.

Recommendations

1. Improvements on RF Report Center dashboard – unique/customized dashboard for PIs: work with RF Central Office and work with Moonshot team to provide dashboard of “all funds” (state and research) reporting for faculty.
2. Need for investigator-friendly, transparent, and easy-to-navigate systems for Purchasing, Accounts Payable, and Research Accounting to support faculty in grants management. Provide interactive process map for Award Life Cycle on the Post- Award webpage to include key departmental contacts and policy websites.
3. Faculty development series conducted by HR, RF Central Office, Research Administration and Counsel’s Office for PIs focused on RF and Upstate policies and procedures including HR, procurement, and other administrative support offices.
4. Continue to improve self-serve applications that will make transactions more efficient for faculty grants management (e.g., purchasing requisitions, employee change forms), including travel application.
5. Implementation of award management sessions to provide smooth transition from Pre-Award to Post Award and advise faculty and department support staff on sponsor guidelines and transactional requirements when awards are established.
6. Additional Upstate participation on key RF Central Office committees to push for changes beneficial to Upstate’s research enterprise.

GLOBAL HEALTH AND INFECTIOUS DISEASE

Working group members include: Stephen Thomas (chair), Katie Anderson, Elizabeth Asiago- Reddy, Joseph Domochowski, Tim Endy, Margaret Formica, Chirs Morley, Harry Taylor

A concise narrative describing current strengths and capabilities;

Current strengths include a relatively small number of faculty with experience conducting global health research initiatives in both the US and abroad. Relationships with partners in overseas locations exist at different levels of maturity and productivity. Faculty and students appear to have a great interest in the concept of global health. The refugee population in Central New York provides a unique opportunity to bridge global health issues abroad with domestic stakeholders. The infectious diseases group has had success in the global health research space, but all agree global health extends beyond ID and there is great potential in these other areas.

A draft strategy to engage, mentor and build collaborations with early career faculty, fellows, residents and students;

The most important message from this discussion was that without modifying or replacing compensation plans that disincentivize physicians from pursuing scholarly activities, there is no mechanism to protect time and allow the pursuit of meaningful research opportunities. There were very good ideas about holding summits or symposia to bring together successful faculty and potential collaborators. A systematic inclusion of potential researchers on projects of established researchers was also discussed. Finally, targeting the hiring of physician-scientists with a robust vetting process was proposed.

A list of technical capabilities, both through personnel expertise and specialized instrumentation;

Summary: A genomics core, bioinformatics, histopathology, imaging, biocontainment facilities, and a strategy around the execution of clinical research (support services and infrastructure) and developing a population health program were all discussed.

A draft strategy to engage, mentor and build collaborations with clinician scientists in your area in order to increase Upstate's translational research portfolio;

The takeaway from this discussion is that there are not enough opportunities for clinical and basic science faculty to engage. Clinicians are underrepresented on in-house grant review committees. There are also no in-house funding calls for translational projects. Creating venues for idea exchange and learning what each side is doing would be helpful.

Descriptions of new faculty hires that would: amplify impact in your area, fill missing expertise, create bridges to other areas of strength at Upstate;

There was discussion about focusing on more ID type hires (support global health strength) to build a powerhouse capability that would drive excellence and forward movement in other areas. Others advocated for an approach with more breadth versus depth and hiring from non-ID global health areas.

Descriptions of new instrumentation and core expertise that would further empower current and future faculty for success;

Expanding capabilities and capacities in histopathology, genomics, bioinformatics and disciplines within population health were all suggested as crucial for success of the Upstate research enterprise. Additional bandwidth is required for clinical research infrastructure to include a re-look at operations in the CRU. Others also proposed that significant holes exist in research administration to include capacity within contract and agreement review and execution, technology transfer and services to support identifying and capturing funding opportunities. Finally, the entire finance and accounting infrastructure needs a re-look.

A draft strategy to address health equity research as a part of the portfolio in the focus area. One work group member will be designated as the responsible party for developing this strategy. Chief Diversity Officer Dr. Daryll Dykes, is willing to serve as a resource to assist;

A more productive relationship with the county DOH would go a long way in developing a health equity research portfolio. Expertise and resources for a broad population health agenda across clinical service lines would also support exploring social determinants of health in CNY. It is unclear what expertise Upstate has in this area; a portfolio review would be advised.

Describe five aspirational goals in your area that could be achieved in the next 5-10 years. These could include center grants, program project grants, large instrumentation grants, training grants, national/international recognitions, Howard Hughes Investigator, etc.;

The issue is less about specific funding targets and more about defining the identity of the Upstate research enterprise today and what we want it to be in 5-10 years. We have a tripartite mission to educate, provide clinical care, and conduct research. These are looked at individually versus identifying where the overlap exists and trying to leverage our unique circumstances that differentiate us from other research enterprises. The identity crisis is one reason even the definition of "global health" needs to be explored and defined for our context. It appears to be ID centered, but only because ID folks established the center and now institute for global health. In fact, the group believes it is a much broader definition. It was mentioned numerous times that success will beget success and investment should be increased in and around highly performing research areas, and then expanding additional areas of research on these platforms. For example, diabetes intersects with ID, health disparities, inflammation, psychosocial, cardiology, etc. Programs must be run as programs and not as silos. There must also be a complete re-look at the business of research at Upstate. The current finance and accounting models and business practices require a strategic re-look with alignment between hospital and University.

Any additional initiatives and approaches that would move the needle in your area.

There was consensus the current research culture of silos versus collaboration hurts the greater University research enterprise.

- One of the biggest barriers to moving the needle in this area (and more generally) is an unwillingness or an inability to work together across some departments/silos. There is a lack of inter-departmental and interdisciplinary collaboration between basic and clinical research faculty; and faculty with a particular expertise tend to stay within their silo;
- More clinical research space
- BSL4 or higher lab space
- Build a capacity for GMP production of biologicals, and training in GMP production of biologicals, to support pre-clinical and early-stage clinical trials.
- Robotics to further enhance nucleic acid and protein processing
- We are growing in terms of vaccine development and clinical trials; perhaps expand institutional capabilities in drug discovery and pathways (basic science faculty, bioinformatics)
- Global health pathway for residents (find ways to support international rotations at field sites?) with associated administrative support
- Global health seed grants (focused on projects at our field sites)
- Global health travel grants (to explore projects at our field sites)
- Global health research journal club
- Gap in population/public health funding, health disparities research – an area that has seen an increase in funding externally.

Aspirational Notes

The desired end state is a well-resourced and strongly led University research platform with the expertise, capabilities, and capacities to support University faculty and staff as they identify global health problems and conceptualize and develop relevant and accessible solutions to the same (idea to bedside). We envision a platform capable of supporting basic science and development of new technologies, small and larger animal-based research, a biologic containment facility supporting small animal and vector-pathogen research, a regulatory science and sponsor office, a biomanufacturing facility developing vaccines and immunotherapeutics, a network of clinical research sites, and a robust research support core.

The platform would be a foundation supporting applications for CTSA status or becoming parts of NIH collaborative networks such as the VTEUs (vaccine evaluation), CIVIC (universal influenza), or similar networks across cancer, diabetes, rheumatologic diseases, stroke, cardiovascular disease, neurologic diseases, refugee health, etc.

A robust and well-resourced platform would encourage greater participation in the research mission by reducing the entry costs for individual investigators and groups. Resources and expertise would be centralized across many of the processes and costs which currently act as barriers to entry and participation. Operational and financial efficiencies would be introduced lowering the overall costs to the University to support research while at the same time increasing engagement and output. The platform would centralize scientific leadership and expertise across the many domains of translational and clinical research offering an opportunity for mentorship and instruction which is currently lacking. Strategic investment and business plans would not only reduce financial burdens, but offer the potential for revenue generation allowing for reinvestment, cost-sharing, and collaboration with clinical service lines and the basic science enterprise to recruit, resource, and retain the best and brightest.

STRATEGIC PLAN FOR RESEARCH IN IMMUNITY AND AUTOIMMUNITY IN DISEASE (IMMUNE- MEDIATED DISEASE)

Introduction: The main goal of our working group was to envision research directions over the next several years in the area of immune-mediated diseases. As these diseases often occur in a tissue-specific manner and involve multiple different immune mechanisms, research projects are highly collaborative and require significant integration across multiple scientific disciplines. After consultation with interested faculty at Upstate, our working group expressed a strong commitment to defining pathways to propel research in immune-mediated disease at Upstate.

Our working group agreed that the focus on immune-mediated diseases is represented by Upstate faculty in three main areas. These are diseases associated with 1) autoimmunity to self-antigens by adaptive arms of the immune system, 2) sterile immunopathology mediated by innate responses, and 3) pathogen-induced immunopathology by both innate and adaptive immunity. All three of these areas are well-represented in current Upstate research programs and constitute a significant strength for further development. In particular, diseases of interest in the first group (autoimmunity) include systemic lupus erythematosus (SLE), rheumatoid arthritis (RA), multiple sclerosis (MS), type I diabetes, and inflammatory diseases associated with transplant immunology. These immune-mediated diseases are driven by autoimmune reactions to self or allogeneic antigens by cells of adaptive immunity gone awry, including T and B cells. Of particular note, research in autoimmunity at Upstate has led to the development of the Lupus, Autoimmunity, Inflammation and Immune Health Center of Excellence (LACE) as described later. Basic scientists, primarily but not exclusively in the Department of Microbiology and Immunology, have significant national prominence in T and B cell biology that could be further integrated with both clinical and basic science faculty in development of multi-disciplinary research on these immune-mediated diseases. In the second area (sterile innate immunopathology) we have faculty working on pathogenic immune responses associated with oxidative and proteostatic stress, inflammasome activation by abnormal extracellular crystals, ischemia-reperfusion reactions in the CNS and heart muscle, and mechanical injury of the lungs as a result of ventilation. Lastly, the area of pathogen-induced immunopathology has been recently appreciated as the cause of multiple tissue-specific diseases including neurodegenerative diseases. These diseases commonly are caused by either persistent infections as in the case of hepatitis C virus or latent virus infections that periodically reactivate to promote chronic tissue inflammation as in multiple human herpesvirus infections. More recently, acute and chronic proinflammatory activities are believed to cause debilitating neurocognitive dysfunctions in Covid-19 survivors. Mechanistic studies of these diseases are focused on both tissue-specific tropism of the virus and consequent inflammation that cause abnormalities in tissue function. Molecular understanding of signaling molecules induced by microbial materials including proinflammatory cytokines in acute and chronic inflammatory disease have been a recent and fruitful area of research into the cause and cure of these diseases. The later would include research being performed at Upstate in the Sepsis Interdisciplinary Research

Center (SIRC) as described later. Pathogen-induced inflammation is also involved in chronic oxidative stress that leads to accumulation of DNA damage and cancer.

In summary, many immune-mediated diseases are primarily tissue-specific and therefore involve a primary interest to clinical faculty in departments including Medicine, Neurology, Surgery and Psychiatry to name a few. Thus, research in this area is multidisciplinary. For example, recent research in psychiatric diseases and neurodegenerative diseases not only involve the clinical departments of Psychiatry and Behavioral Sciences, Neurology and Neurosurgery, but also involve research expertise in immune cell signaling (e.g., Pharmacology; Microbiology and Immunology), mitochondrial function (e.g., Biochemistry and Molecular Biology), and CNS function (Neuroscience and Physiology). Also, the SIRC group combined the disciplines and treatment strategies for severe sepsis using faculty from the Departments of Surgery and Pharmacology in their recent DoD grant submission. In all, we believe that development of this integrative area of research will lead to large multiple PI grants, significant progress in understanding the cause and perpetuation of immune-mediated diseases and eventual successful treatments and cures.

Technical Capabilities: At Upstate, there are many faculty members involved in immune-mediated disease research. The Department of Microbiology and Immunology consists of 16 primary faculty members and 11 joint faculty members who have primary appointments in the Departments of Pediatrics, Neurology, Medicine, Surgery. Their research interests include pathogenic and nonpathogenic human diseases related to immune-mediated disease. Our faculty have excellent technical capabilities to approach immune mechanisms and pathogenesis of human diseases causing by a broad range of pathogens such as viruses (HSV, EBV, CMV, VZV, KSHV, HTLV) and microorganisms (*Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Escherichia coli*, *Haemophilus influenzae*), using various cell culture and animal models of human disease as well as clinical samples from patients. Experimental animals include small animals (wild-type, genetically modified and humanized mice and rats) and large animals (pigs, rabbits, and monkeys). Our faculty also have excellent technical capabilities to investigate pathogenic immune-mediated diseases such as lupus, multiple sclerosis, allergies, cancers (Leukemia, lymphoma, and oral cancers) and sepsis-induced multiple organ failure (MOF) with animal models and clinical samples from patients. A primary goal is to understand how the immune system causes disease and thus to develop better treatments for these debilitating diseases. Research of immune-mediated disease at Upstate is conducted at the cellular and molecular, biochemical and genetic levels using various state-of-the-art methods and techniques.

The following specialized instrumentation is available for immune-mediated disease research: 1) A severe combined immunodeficiency (SCID) mouse facility, which has been successfully used to develop human xenograft models, humanized transgenic and immunodeficiency mice for the testing of immunomodulatory therapeutics, virus and bacterial diseases, and human surfactant protein immunity, 2) An in vivo imaging system, which is available to visualize virus replication, bacterial growth and cancer responses to chemotherapy in whole animals, 3) Upstate Vector Biology Lab (VBL) is a state-of-the-art facility for research, including different biocontainment levels (BSL-2, ABSL-2, BSL-3, and ABSL-3), 4) Upstate Flow Core is available for immune-mediated disease research, 5) Upstate Leica Center of Excellence for Advanced Light Microscopy and 6) a large animal laboratory with a well-developed clinically applicable porcine model of sepsis-induced ARDS and MOF.

Funding Trends: There has been significant new funding in the area of tissue-specific immune-mediated disease at Upstate. These include grants for both basic science and clinical trials initiated by Upstate faculty. This support is likely to increase in coming years as these diseases often afflict our aging and diverse populations in the Upstate region that will need to be addressed in both mechanistic studies and clinical trials supported by federal funding agencies.

New Hires: Since the NIH Autoimmune Diseases Coordinating Committee (ADCC) members include over 12 NIH Institutes, Offices, and Centers and also includes the FDA, VA and CDC, there are ample opportunities to launch multiple federal research grant applications to study immune-mediated diseases at Upstate. About 50% of funding goes to investigator-initiated studies with an emphasis on basic science. Joint appointments across at least two departments should be sought due to the interdisciplinary nature of immune-mediated disease research.

Two areas of significant investment for the NIH are genetics and biomarker development, which includes bioinformatics and application of new technologies. There is an interest in sex steroids, particularly the role of estrogen and HLA variants in immunopathology. The development of biomarkers can enable earlier diagnosis as well as aid physicians in selecting and monitoring treatment. This aligns with an articulated goal of the LACE at Upstate, and enhancing these clinical capabilities would benefit the study many immune-mediated diseases. Reinforcing and expanding this center to include other immune-mediated diseases seems advisable. There is a strong interest in pathogen-induced immunopathology (viruses and bacteria) among the existing faculty studying chronic inflammatory diseases and autoimmunity.

A number of NIH-supported studies have shown that regulatory T cells are crucial in controlling diseases such as type 1 diabetes, Crohn's disease, and ulcerative colitis. An interest in regulatory T cells overlaps with that of the Upstate Cancer Center as there is interest in the role of immune cells in glioma (as identified in current clinical trials/grants). The latter constitutes a recruitment opportunity in Cancer and Immunology/Rheumatology.

Since many major neurological diseases (including multiple sclerosis, Alzheimer's disease, and general cognitive decline with aging) and major mental illnesses (including depression, schizophrenia, systemic lupus erythematosus, and ADHD) have an inflammatory basis, there is also overlapping interest in the immunological basis for CNS disease. These common interests constitute a recruitment opportunity in Psychiatry/Neurology/Neuroscience and Immunology/Rheumatology.

NIH launched several large-scale initiatives to address multidisciplinary, cross-specialty issues that are beyond the capabilities of a single investigator, so hires across clinical and basic science departments with interests in tissue-specific immune-mediated disease is advisable. Investigators in neuroimmunology are especially attractive given our existing strengths in Brain Science and diseases involving significant immune-mediated inflammation. Growth in neuroimmunology at Upstate would help expand relationships between multiple Upstate investigators already in place (supported by multiple PI grants awarded and submitted), and would fit an NIH initiative focused on studies that examine how the immune system modifies brain function and behavior. Recent research shows significant effects of inflammatory cytokines and immune cells in brain regions regulating cognition and emotion and pathways mediating bidirectional communication between the brain and peripheral circulation have been identified. Newly developed tools are enabling the localization

and measurement and extent of inflammation, as well as helping to identify novel roles in normal brain development and function for proteins that were previously believed to function only in immune-activated states. Basic studies such as these are essential for uncovering the machinery regulating the long-term deleterious impact of immunity on brain function.

New Cores: To advance the research of immune-mediated diseases at Upstate Medical University, there is an urgent need to establish and provide the following: 1) an institution-supported core for biobanking of high-quality human and animal biospecimens, 2) an affordable and timely research histopathology service associated with the Department of Pathology and outside contracted providers for high-volume samples, and 3) a centralized database/webpage providing information about available resources at Upstate Medical University across all the departments, SUNY-ESF and Syracuse University to perform specialized imaging and biochemical analysis of the samples. These are further described below.

The need for an institution-supported biorepository is based on the direction from NIH/NIAID to focus on improvement of patients' outcomes by fostering development of individualized care and personalized medicine. This can only be achieved by being able to compare outcomes or various disease-markers across multiple patients and age/sex/race-matched healthy volunteers. Immune-mediated diseases, whether type 1 diabetes, multiple sclerosis, lupus or rheumatoid arthritis, to name the few, are all connected in their underlying cause of overactive immune system and in the way the immune system attacks the body's tissue. The overarching goal of the biorepository core will be to facilitate basic, translational and clinical research and serve as a network-building tool, allowing researchers with shared interests to connect and collaborate in disease investigation.

This biorepository should be cross-departmental and support all phases of biospecimen acquisition, analysis and distribution including: 1) The biorepository should offer fail-safe redundancy, temperature-monitored and regulatory compliant sample storage for RT, 4-degree C, -20-degree C, -80-degree C and liquid nitrogen, 2) Solid tissue acquisition and processing should be provided by biorepository staff directly from the operating room and clinical suites including a designated pathologist assistant for expedited tissue triage, distribution and/or processing, 3) Biofluids acquisition should be followed by automated and safe BSL2+ processing for a wide variate of derivatives through the repository's fractionation and isolation services, 4) Biorepository should have the capacity to perform automated DNA and RNA isolation and purification from both solid tissue and biofluids, 5) Biorepository should obtain research samples in a de-identified but clinically annotated manner covered by its own IRB protocol to streamline sample distribution to requesting researchers, 6) A centralized human subject preregistration system for vital organ donation should be instituted to facilitate the acquisition of high quality post-mortem tissue samples specifically targeted for research (this could potentially involve the anatomical gift program at Upstate to facilitate the recruitment process), and 7) The biorepository should meet the standards developed by NIH, with state of an art instrumentation enabling centralized tracking of each sample and its de-identified health information. Rigorous management of the repository, which can be acknowledged in R01, multi-PI or center-based grants as well as clinical trials, will enable the repository, as a core, to apply for NIH funding to diversify the biospecimen collection and meet needs of newly hired faculty.

A research histology and electron microscopy service should be an institution-supported core facility. This core should contain fundamental components indispensable to performing studies associated with the role of the

immune system in diseases of various organs, such as kidney, brain, lung, heart or skin for example. Presently, most of the faculty in various departments are forced to either invest in the instrumentation on their own and perform these tasks within their own laboratories or outsource the services to other institutions or private companies for a significantly higher price. The current situation is significantly slowing down the productivity and lowering competitiveness of Upstate researchers to obtain contracts, which will require pre-clinical histology analysis and electron microscope imaging. The overarching goal of the research histology and electron microscopy core will be to provide high quality histology services in light and electron microscopy imaging and instruction to all Upstate, SU and ESF investigators in a cost-effective, value-added manner. The core will prepare paraffin embedded and frozen tissue sections for routine histology, special stains and immunohistochemical studies performed with assistance of trained technician or by the investigator. The electron microscopy core will provide technical assistance with sample preparation and access to instrumentation, training, and service using scanning (SEM), transmission (TEM) and scanning transmission (STEM) electron microscopy.

Building Collaborations Between Basic and Clinical Faculty: Closer collaborations between basic scientists and clinical faculty are needed to link immune-mediated disease with causation. To facilitate such collaborations, we recommend the establishment of a new translational

research department of pathobiology. This department would include both basic research and clinical faculty. Their role would be to prioritize clinically relevant disease for functional studies that would include immune-mediated diseases. In this effort the following considerations would be essential tasks: First, would be to identify clinically relevant immune-mediated disease as priorities for basic and functional studies. Second, would be to develop a large immune-mediated disease database, which could be shared between basic science and clinical faculties. By doing this we would be able to link the phenotypes of human disease with basic laboratory models. Third, we need to establish a simple model in which we could promote cross-disciplinary understanding and opportunities for interaction of clinical faculty with graduate students and research postdoctoral fellows in pursuit of training more PhD scientists in pathobiology. Conversely, we should make basic research more available to medical students and residents, thereby attracting and training a greater number of physicians in research.

The basic science departments have excellent faculty and are more than willing to take their basic research to translational research with increased interaction with clinician scientists. In the Department of Microbiology and Immunology there are multiple faculty members engaged in discovering mechanisms of immune-mediated disease. These include faculty working on various aspects of viral pathogenesis, vaccine development, immune signaling in disease, and autoimmunity. Research in these laboratories is closely related to clinical research. For instance, clinical faculty who are working in the area of basic immunology who are willing to collaborate are Dr. Mark Laftavi in organ transplants, Dr. Rauf Shanbzo in the islet transplantation group, Dr. Teresa Gentile in Hematology and Oncology, Dr. Hariss Mobeen in the Kidney group, and the Surgery and Medicine Departments collaborating with the Nieman Acute Lung Injury group on protective mechanical ventilation strategies for ARDS patients.

Therefore, our goal should be to develop future collaboration grants between basic and clinician scientists in a new translational research department. Federal and private foundations will mainly support proposals that include clinically relevant models and are supported by clinical faculty. Currently, our translational

grants are marked down for research environment. The establishment of a translational research department composed of basic and clinical faculty would fill this gap for environment. This new department will not only satisfy demands by federal and foundation grant agencies but will also facilitate the interaction of physician-scientists and basic scientists. Through a translational research department, medical students could rotate six months to a year in basic research laboratories with faculty from basic science departments. This will help them gain residency in a research-based institution hospital. Additionally, through this joint program, PhD students could spend three to six months in clinical departments including infectious diseases, autoimmunity, transplantation, and hematology and oncology. Through this interaction PhD students could seek productive careers in clinical departments (Baylor Medical School and the NIH Clinical Center have been doing this for years). This department will constitute an effective bridge between clinical and basic science departments, that encourages gifted students to attend Upstate. This will result in a homogeneous culture with the premise that laboratory and bedside are interdependent as well as indissolubly linked. As such, a one-semester course in pathobiology for PhD students and postdoctoral research fellows could provide essential appreciation for clinical aspects of immune-mediated disease.

Mentoring Our Scientists: The best strategy to engage, mentor and build collaborations with early career faculty, fellows, residents and students is to form an official institution-wide immune-mediated disease interest center, modelled after the LACE as developed by Dr. Andras Perl and the Sepsis Interdisciplinary Research Center (SIRC) initiated by Drs. Robert Cooney and Juntao Luo. Activities within such a center, which would have a dedicated coordinator supported by Upstate Medical University to manage the Center's webpage, twitter account and seminar series, would enable both early and senior scientists with related interests to form a hub to meet and connect. Such activities would include, but are not limited to: 1) opportunities for junior investigators to present preliminary results, hypotheses, and specific aims to senior investigators, orally or in writing (these senior investigators will provide constructive feedback in preparation for the junior investigators' grant submissions or oral presentations), 2) participation in a seminar series connecting aspects of immune-mediated diseases including autoimmunity and other chronic inflammatory diseases across different departments, 3) inclusion of young investigators to participate in governing of the center, especially aspects related to career development, which would translate in the enhancement of administrative skills of young researchers, direct interaction with senior researchers and development of their curriculum vitae, 4) enable young investigators to engage in community service, where awareness about immune-mediated diseases is disseminated (this can be achieved by presenting a series of medical science lectures led by pairs of senior and young faculty from Upstate, free and open to the public), 5) the center will also enhance alumni relations, which could provide guidance for career development of young trainees (such a center will also enable a better visibility of the immune-mediated disease research performed at Upstate and potentially lead to financial gifts and endorsement from private donors or the industrial sector), and 6) financial gifts would then enable sponsoring of summer research internships for medical students, travel awards to attend conferences, performance of research at other institutions and establishment of new collaborations (alternatively, outside support could sponsor visits and lectures from distinguished scientists from other institutions, which could focus on the interaction of the invited speaker with young trainees).

Addressing Health Disparities in Research: Immune-mediated diseases are a family of more than 80 chronic, and often disabling illnesses impacting up to 10% of the population of Upstate NY and their prevalence appears to be rising. These can involve loss of organ function, reduced productivity at work, and high medical expenses and disproportionately afflict women. These diseases are among the leading causes

of death for young and middle-aged women and they impose a heavy burden on patients' families and on society.

Systemic Lupus Erythematosus (SLE) is a highly prevalent autoimmune disorder affecting multiple tissues including the CNS and kidneys. Study of SLE constitutes a major research strength at Upstate that addresses deficiencies in health in diverse groups in the CNY area. SLE patients served by Upstate constitute a cohort of over 800 patients with predilection rates up to 90% for females ranging in age from 18 to 80. The prevalence of SLE is also four times higher in African American populations and there are marked differences in the incidence related to race and ethnicity. Specifically, both African American and Hispanic SLE patients tend to develop the disease earlier in life and experience more severe disease than Caucasian patients. Further, African-American patients with SLE have a higher frequency of neurologic complications such as seizures, hemorrhage and stroke, while Hispanic patients experience cardiac disease more frequently. Additionally, the prevalence and burden of immune-mediated diseases including rheumatoid arthritis and insulin-dependent diabetes are increased among Native Americans in Central New York.

There are also unique considerations of immune-mediated disease in children. First, the incidence of type 1 diabetes among children under five years of age has been increasing and this disease presents many challenges related to diet, meal planning, symptom recognition, and blood glucose monitoring for parents with unique challenges for African-American mothers who are often less socially supported. In terms of juvenile arthritis, there is increasing awareness of the need to focus on pain and anxiety in children with arthritis requiring behavioral support in addition to medication. The department of Psychiatry and Behavioral Sciences has unique strengths and programs in providing behavioral support for these diverse populations.

We acknowledge that there is likely a long-standing pervasive injustice around age, sex, race in research of immune-mediated disease due to the fact that more educated individuals and their children are more likely to have better nutrition, cleaner environments and more optimal insurance coverage needed to seek out advanced care from specialized clinics to treat these afflictions. There are also damaging effects of chronic stress on the body and the brain related to growing up and living in impoverished environments. Thus, there appears to be an opportunity to more closely consider issues of sex, racial and age inequalities in the experimental designs, clinical studies, biomarkers studies, treatment choices or longer-term follow-up care. Preventive approaches for particular populations are also a main goal as many immune-mediated diseases are caused by diet and infection by particular viruses and bacteria. Since Upstate is in proximity of a racially diverse urban area, and within driving distance to many remote rural populations, Upstate is in a position to expand the research participant pool in research of immune-mediated diseases, including of Native Americans in Upstate NY.

Aspirational Goals for Expanding Research: We have established some key aspirational goals with respect to obtaining large grants to support research on immune-mediated diseases. We have and plan to apply for multiple large research grants that are currently highlighted on both the Department of Defense (DoD) or the NIH websites. The important component necessary to apply for more of these large grants will be to identify groups of Principal Investigators (PI) at Upstate interested in working together on a similar research question. For instance, Professor Gary Nieman and Dr. Juntao Luo are members of the SIRC group at Upstate. Initially, they submitted several dual-PI R01s combining the expertise of each lab to develop a treatment strategy for sepsis, but were also looking for a mechanism to submit a large grant with multiple SIRC PIs. They identified

and applied for a CDMRP (Congressionally Directed Medical Research Programs) Focused Program Award (funded by the DoD) that requires at least four PIs with independent projects to solve a common complex medical problem. The Focused Program Award developed by the SIRC group decided to solve the medical problem of treating sepsis-induced acute respiratory distress syndrome (ARDS). They made this choice based on the significance of the problem and the scientific strengths of the five PIs who decided to join the group on this submission. If funded the award would be \$7.2 million in direct costs and another \$4.5 million in indirect costs for four years.

In order to facilitate the development of more of these types of applications in the future, our report group recommended the following approaches: First, is to establish a depository listing the PIs interested in possible collaborations on large grants and a list of research questions posed by these PIs, which they would like to submit as a CDMRP Focused Program Award from the DoD, or 'P' or 'U' awards from the NIH (criteria and goals for these large DoD and NIH grants are found on their websites). The depository could be subdivided by disease categories, since multiple PIs often study very different treatment strategies for the same disease. For instance, a lead PI interested in submitting a large grant could use the depository to identify other PIs at Upstate studying the same or similar disease or who have laboratory capabilities necessary to conduct the proposed study. The lead PI would then build a scientific team necessary to construct a competitive application. Or, PIs could browse the depository list and identify if there is a project underway on which they could contribute. Second, we could also establish a list of each lab's capabilities on the depository. For example, Dr. Gary Nieman's large animal, clinically applicable physiology lab is set up similarly to an Intensive Care Unit (ICU). Using this translational high-fidelity facility, the PI can conduct efficacy studies on novel therapeutic treatments and compare these to the current standard of care treatments to generate the data necessary to support a human clinical trial. If a PI has been successful in testing a novel therapeutic in small animal models and was at the point that a large animal efficacy study was required, then the large animal, clinically applicable translational lab might be the perfect fit for conducting this study. Translational animal models can be an important component in large federal grants. Third, we could have a Large Grant Meeting held periodically and have investigators interested in being the lead PI on a large grant give a presentation overviewing the study they would like to lead. Participation of clinical departments would also be important to promote clinical trials as part of the large grant applications. Fourth, we need to set up a system that identifies Program Announcements released by the DoD and NIH for applications that require large grants that are distributed to the PIs in the depository.

An additional excellent model for development of a center of excellence in immune-mediated disease at Upstate has been developed by Dr. Andras Perl. His main focus as a clinician scientist has been directed to the pathogenesis and treatment of SLE. Beginning in 2008, he organized several meetings of Upstate investigators to develop joint platforms and infrastructure to develop program projects seeking extramural funding. A milestone in expansion of this center was the designation of the LACE 10 years ago by the Federation of Clinical Immunology Societies (FOCIS), an international organization, as a Center of Excellence. This recognition opened up the possibility of applying for larger center grants from the NIH to develop new treatments for SLE, including U01 grants to support mechanistic causes and clinical trials for SLE. LACE has been supported by New York State ECRIP Program between 2017 and 2019. Further, Dr. Perl has collaborated on NIH-supported studies of SLE initiated by Drs. Iwona Koenig, Stephen Faraone, and Gary Winslow.

As well, such recognition allows for application of NIH U19 grants that fund establishment of full- fledged NIH Autoimmunity Center of Excellence and accompanied applications for T32 training grants, both from NIAID. Progress to date in this long-term process was recent granting of a U01 award to Dr. Perl to support a multicenter clinical trial on the efficacy of N-acetylcysteine in SLE. He has a second R34 planning grant for another U01 project aimed to carry out a mechanistic clinical trial with rapamycin in SLE. The goal now is to develop an overarching U19 grant with at least four PIs with independent yet interrelated projects in immune-mediated disease upon which a center of excellence in these diseases can be established with lines available with T32 support for appropriate training of new scientists in this rapidly expanding field of immunology. Participation in this center as PIs is anticipated to be wide-ranging among many departments with interests in the role of immune-mediated inflammation in various tissues including lungs (interstitial lung disease, pulmonary hypertension, and mechanical and pathogen-induced lung damage), brain (chronic neurodegenerative and neuro-psychiatric diseases), cardiovascular system (atherosclerosis), metabolic diseases (autoimmune diabetes, thyroiditis, adrenalitis), gastrointestinal diseases (inflammatory bowel disease, autoimmune hepatitis, pancreatitis, sialoadenitis), renal diseases (lupus and other forms of autoimmune nephritis) and other multi- tissue systemic autoimmune diseases like SLE. Acquisition of this level of NIH funding is likely to require significant infrastructure and personnel support by the administration as this is a key score-driving criterium used by NIH reviewers.

Together, these past efforts from two highly productive clinical research laboratories have proven the feasibility of developing large translational research projects and centers at Upstate in the field of immune-mediated disease that need further growth and institutional support for the expansion that we want to realize in the future. We envision one overarching center of excellence supported by large NIH funding mechanisms to support basic research and develop cures for all forms of immune-mediated disease.

MECHANISMS OF DISEASE WORKING GROUP REPORT

1. Narrative describing current strengths and capabilities

There is strong NIH funding (primarily R01 and R21) to individual investigators in the Mechanisms of Disease topic area, including multiple grants to several investigators. This is a good basis to build on for collaborative grants. Existing experimental strengths include structural biology (NMR, X-ray crystallography, cryoEM, and molecular modeling), advanced microscopy and imaging, and model systems for disease mechanisms. We propose five potential research areas that could build on these strengths to develop collaborations:

- a. **Proteostasis:** Age-related neurodegeneration and other diseases are accompanied by protein accumulation. These problems can be addressed from multiple directions, including examination of cellular proteolytic mechanisms, chaperone function, and liquid-liquid phase separation.
- b. **Cell motility:** Cell migration and cytoskeletal structure are central in multiple pathological processes including cancer, wound healing, and fibrosis. There is substantial expertise in these areas.
- c. **Transcription and epigenetics:** Metabolic control of gene expression and epigenetics is an emerging area of research interest that could bridge existing expertise in gene expression, chromatin structure, and energy metabolism.
- d. **Structural studies of potential pharmacological targets:** Structural studies are a first step that can lead to in silico and in vitro screening and ultimately clinical trials. They can also help in modeling drug resistance.
- e. **Cell signaling in normal and pathological states:** Investigation of signaling pathways can generate research that crosses disciplines and impacts multiple disease states. It can link investigators with expertise in immunology, cancer, and the visual system with those with basic interests in ion transport, apoptosis or gene expression.

2. New faculty hires

It should be noted that the strategies for the hiring of research-focused faculty over the last decade have been largely successful, since NIH funding (much of which concerns Mechanisms of Disease) has grown by about 50% over the past five years. That said, targeted/strategic hiring in several areas could further enhance progress, either by enhancing existing programs or triggering the development of others. Four specific areas for hiring were identified:

- a. Faculty with research programs in structure-based drug design and/or high throughput screening that should be able to build on and enhance existing structural biology, drug delivery, protein-protein interaction and cell-signaling expertise.

- b. Faculty with research programs in Alzheimer's disease and other neurodegenerative disorders (taking advantage of the approved Empire Innovation hires plus additional related faculty hires) should be able to work with existing researchers and build new programs, in line with institutional priorities.
- c. Provide faculty (MD or PhD) with 100% protected time to work with selected clinical leaders who have a clear and present ambition to forge collaborations with Basic Science faculty and build research centers (this could/should be driven by enlightened Clinical Chairs). An initial focus should be Cardiovascular Science to stimulate development of the Heart Center.
- d. Fund clinician-scientists with sufficient protected time to allow for the development of robust, sustained and extramurally-funded research programs, who will be assessed by rigorous tenure and promotion criteria.

3. Core expertise and new instrumentation needed for ongoing research success

- a. Attracting high quality postdocs and research support staff. A major bottleneck in expanding the research portfolio at Upstate is attracting self-motivated, independent postdocs and research staff. These personnel free up time allowing PIs to explore new research areas by taking on the day-to-day execution of projects and much of the training of students and other staff. Motivated postdocs can drive new research endeavors, opening new funding opportunities. This should be a major area of investment that will ultimately pay dividends in the form of funding new and larger projects. To attract postdocs and staff we suggest the following: 1) Postdoc training committees like those we have for graduate students; 2) Postdoc seminar series where postdocs present their research and receive feedback from other Upstate researchers; 3) Tracking postdocs at Upstate and after they leave. These data are needed for obtaining training grants, which will include funded lines for postdocs, as well for F30, F31, and F32 applications; 4) Greater focus on seeking F32 funding for postdocs. Over the last 20 years, Upstate has performed poorly in this category, with a total of only 6 F32s. 5) Build on existing programs for postdoc mentoring – Broadening Experiences in Scholarly Training (BEST) program at Cornell and other NIH BEST-participating institutions; 6) Explore alternative funding mechanisms for training like the Innovative Programs to Enhance Research Training (IPERT) (NIH R25); 7) Named and funded postdoc positions, like "Empire Postdoc"; 8) Aggressively advertise Upstate research locally to draw motivated students into research careers.
- b. Professional research support staff. There is significant need for expanding professional research support staff. Dedicated statistical service for researchers will enhance productivity and grant application success rate. Professional grant editing services (internal or external) should be supported institutionally and will improve impact scores.
- c. Research computing infrastructure. According to HHS policy (https://ori.hhs.gov/education/products/rcradmin/topics/data/tutorial_5.shtml), both the PI and the Institution are responsible for research data stewardship. Because Federal grants are agreements between the Federal Institutes and the institutions where the contracts are executed, the institution bears the primary responsibility for stewardship. Cloud storage and/or local storage administered by Upstate as well as better institutional support for research-related computing is needed.

d. Histology and microscopy support. Histology core to support standard embedding and frozen sections, staining (chemical and immune) and imaging is needed as well as support for TEM sample prep and imaging. Animal phenotyping support such as blood testing and metabolic studies, would be especially useful for those doing translational research.

e. Expanded bioinformatics expertise. Expertise with big data sets for pathway analysis and extracting statistically significant hits are needed after performing transcriptome analysis. Furthermore, partnership in writing technical screen details and selection criteria into NIH grants will improve grant scores. This position could be paid by Upstate as a staff member with co-authorship from the collaborative lab, as a fee-for-service pay structure, and/or as a position that is supported by several Departments.

4. Strategy to build collaboration with clinical scientists/translational research

In an effort to increase the impact of research projects focused on the Mechanisms of Disease, it is imperative to foster collaborations among clinicians, clinical researchers, and basic science researchers. These efforts will establish a stronger foundation for translational research, multi-PI research grants, and the development of research centers. To do this, a low-cost/high-benefit strategy is to develop a forum to foster cross-departmental and cross-disciplinary discussions and discourse. These plans include journal clubs, joint lab meetings, "lightning short-talks," and grand rounds (department seminars) that are co-led by a physician and a basic science researcher. A model of team-science based research that developed organically is the Sepsis Interdisciplinary Research Center (SIRC, <https://www.upstate.edu/pharm/sirc/>.) It includes investigators in the Departments of Surgery and Pharmacology that have come together to generate several funded and submitted multi-PI SIRC grants. There are other untapped opportunities throughout the university as clinicians face challenges related to "protected time", staffing, and resource constraints. In order for these programs to succeed and these efforts to gain momentum it is vital for clinical chairs to establish environments to foster research. Additionally, an Assistant VP of Clinical Research could oversee research across all of the clinical departments and help grow the physician-scientist research program. This starts with a focus on recruiting and retaining physician-scientists. Those with proven research expertise (i.e., training, publications, funding) must have adequate protected time to grow their research programs and collaborate with basic science researchers. This protected time will enable physician-scientists to acquire the necessary preliminary data for grant funding, grow their research team, and ultimately foster the success of physician-scientists.

5. Strategy to engage and mentor junior faculty, fellows, residents, postdocs, and students

In order to increase medical student and resident/fellow participation in research, improve recruitment and training of postdoctoral researchers as these trainees are critical in order to successfully compete for NIH training grants, and increase grant application success rates for junior faculty and pre- and postdoctoral trainees, we propose:

a. Increase participation of medical students and residents/fellows in research: Upstate medical students are routinely offered the opportunity to engage with Upstate Faculty researchers. MS1 students are eligible to apply for a competitive eight-week summer research fellowship-mentored program administered between the summer of MS1 and MS2. To provide a clear path for medical students to continue their engagement in research, we propose the creation of a one-year research-intensive break from the medical school program ("biomedical scholar year") for those students who are interested in an in-depth immersion into biomedical research. The goal will be to allow medical students to incorporate scientific knowledge

into clinical decisions, become more competitive in their residency program of choice, and consider the clinician/physician scientist career track. It will also help attract students to residencies at Upstate instead of relocating to other institutions.

Similarly, exposure of residents and fellows to biomedical research opportunities will deepen their understanding of disease mechanisms, encourage basic/clinical cross-departmental collaborations, improve their future career prospects through research accomplishments and publications, and guide them towards a possible career as clinician-scientists. Creating opportunities for focused research activities and sustained mentoring (for example, a four- to 12-month dedicated research rotation in a research lab) would be critical to achieve these goals.

b. Improve recruitment and training of postdoctoral researchers: Postdoctoral fellows and graduate students would benefit from a comprehensive training and mentoring program that takes into consideration a number of potential career options (industry, regulatory affairs, science communication, and teaching). Please see above (3a) for methods to improve postdoc hiring, retention, and grant funding.

c. Improve grant application success rates for junior faculty and pre- and postdoctoral trainees: Junior faculty in basic and clinical departments face a number of challenges when applying for research and training grants. These include the need for grantsmanship training, the constantly changing landscape of funding opportunities, their lack of grant application and study section experience, and the fact that the review process for some funding opportunities, such as the NRSA fellowships, emphasizes the PI's track record in mentoring students and postdocs, thus potentially placing junior faculty at a disadvantage. In order to overcome these challenges, we propose the following approaches:

- (1) Organize regular panel discussions targeted to junior faculty, fellows, residents, and graduate students in which faculty members with study section/review/editorial board experience discuss how study sections work and what reviewers are looking for in grants and papers.
- (2) Create an Academy of Research Faculty similar to the Academy of Upstate Educators, consisting of potential senior co-mentors for trainees applying for F30/F31/F32 grants and faculty available for grant advice.
- (3) Create a panel of researchers with study section experience that junior faculty can ask for advice and critical reading of their applications.
- (4) Spearhead opportunities for peer-to-peer networking and peer-mentoring among junior investigators, in order to recognize that challenges experienced by each researcher are unique and depend on their specific area of research, specific funding sources, and the ongoing changes in the funding landscape.

6. Health equity research

In an effort to further our goal of promoting diversity at Upstate, we propose a STEM program to cultivate talent from Syracuse teen-youth. The idea of working in a cutting-edge science lab may seem like an impossible goal for many inner-city kids, however, it is, and should feel like, an obtainable goal. Local Syracuse high-school students can participate in the SYTE-program making college a reality for many families,

perhaps between their junior and senior years of high school. Furthermore, PhD programs support students with no-cost degree programs and stipends for living costs. It is possible, if not likely, that many Syracuse-resident students are not aware that a graduate degree can be obtained without cost. That information alone could open up the minds of talented teenagers to start to think about a career in science. We propose a paid eight-week summer program for Syracuse-resident senior high school students. Importantly, the summer will include weekly seminars from Upstate faculty with mandatory attendance. The goal of these seminars would be to convey the “wow factor” of science, to explain possible avenues of study, and to demonstrate engaging and exciting model systems used to test scientific questions. The

science teachers from the high school classes should be invited to attend the seminars. A program like this could be funded by the NSF: <https://www.nsf.gov/pubs/2018/nsf18088/nsf18088.jsp>. This would be a mechanism to bring in and illuminate disadvantaged youth and at the same time bring prestige to Upstate for obtaining NSF funding in this critical area.

7. Five aspirational goals

The aspirational goals we propose here serve to add distinction to Upstate’s research establishment and reinforce our research prestige locally, statewide and nationwide:

- a. Repeat the 50% increase in federal research funding in the next five years. Over the past five years the NIH federal research funding to Upstate Investigators has increased by 50%. Our goal is to maintain this trend and repeat the 50% increase of federal research funding to Upstate researchers.
- b. Introduce an interdisciplinary distinguished seminar series. Basic and clinical departments host a selected but limited number of visiting speakers who contribute to the specific specialty and research field. We propose the introduction of a robust distinguished seminar series sponsored by the Upstate Research Office, where exceptional outside speakers with an interdisciplinary focus are invited (including editors from high-impact journals covering different fields, “permanent” members of standing study sections, Nobel laureates, members of HHMI etc.).
- c. Market our research on diseases with high prevalence within the Upstate New York community locally and nationally. Upstate researchers routinely study communicable diseases and chronic diseases (heart, cancer, stroke, chronic Lyme Disease, eye diseases and diabetes) experienced by our local community. We propose investing in systematically marketing our research through better communicating with local, statewide and nationwide communities, using traditional and social media formats. We seek to convey the research we do at Upstate to study, mechanistically understand, develop therapeutics and treat or cure diseases and ailments that affect the well-being of communities.
- d. Recruit and retain high-quality postdocs.
We propose to improve our current postdoctoral recruitment program at Upstate, emphasizing not only individual/independent research but also building toward the establishment and expansion of training grants and fellowships.

- e. Engagement with the local community that is continuous and supportive.

We recommend opening a dialogue with high schools within the local community of Upstate New York, with the goal of attracting high school students into the world of science. This initiative will increase diversity and participation of highly motivated teenagers into the world of science and research.

8. Funding trends over last 5 years

- a. NIH funding to Upstate has increased by 50% in the past five years (from \$14.26 million to \$21.58 million). This funding is broad based, and is particularly strong in the area of Mechanisms of Disease.
- b. In terms of the NIH institutes providing support, over the past five years Upstate received the highest level of funding from NIGMS (\$15.1 million), followed by NIAID (\$11.6 million) and NEI (\$11.1 million), then NIDDK (\$9.3 million) and NIAMS (\$8.9 million).
- c. Funding from five institutes (NIA, NIDDK, NEI, NIGMS, and NHLBI) more than doubled in in the past five years, suggesting these are areas where there has been significant growth.
- d. Funding from Department of Defense and NSF have been relatively flat over the past five years, but there has been some increase in VA funding.

9. Existing technical capabilities—personnel and specialized instrumentation

- a. Leica Center of Excellence for microscopy; imaging facilities in the NRB
- b. Upgraded NMR, cryo-EM and proteomics (all funded at least in part by instrumentation grants)
- c. Biomolecular interactions core — high throughput screening capability
- d. SUNY Molecular Analysis Core
- e. Flow cytometry core

NEUROSCIENCE WORKING GROUP REPORT

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The Neuroscience Working Group (NWG) represents the research faculty of the departments of Neuroscience and Physiology, Ophthalmology and Visual Sciences, Psychiatry and Behavioral Sciences, Neurosurgery, and Neurology as well as academically-minded clinical faculty from Neurology, Neurosurgery and Geriatrics. The overarching goal of this planning effort is to strengthen this community through better integration and strategic investments.

The NWG was in remarkable agreement regarding the challenges and opportunities presented by the strategic goals of winning larger grants and engaging with the clinical faculty in translational research.

- The effort to obtain larger, center-style grants is hampered by the comparatively small research community at Upstate. Hence, the NWG believes that efforts in this direction require a gradual approach and must include formation of inter-departmental collaborative groups, winning of large MPI grants, expansion through a series of strategic hires, and development of regional or national partnerships.
- A critical challenge in developing basic-clinical collaborations is the lack of protected time for clinicians. The current relative value unit-focus strongly disincentivizes research efforts of clinical faculty and residents alike, and is not compatible with the mission of a medical research university. Sustained expansion of clinical and translational research is unlikely unless this issue is addressed.

The NWG also developed a number of proposals to strengthen the neuroscience research community.

- First, there is a commitment to increase intra- and inter-departmental cross- fertilization efforts. These start with locally controlled initiatives such as adding clinical lecturers to graduate courses, creating a “research liaison” position in each department, providing ample opportunities for interactions (basic-clinical science seminars, workshop, biennial retreat, etc.), and promoting interdepartmental grant submissions (MPI, T32). They then extend to local, regional and national inter- institutional collaborations that will elevate the profile of Upstate neuroscience.
- Next, the committee was enthusiastic about establishing a pilot mechanism to fund projects that involve both clinical and basic science researchers, joining efforts in broader research areas of cross-departmental interest (non-human primate model, in vivo ocular imaging diagnostics, bioengineering and organoids, etc.). In this context, seed funding for trainees (MD-PhD students, postdocs and residents) would help us develop stronger collaborative teams, and a robust track record for institutional training grants and MPI grants.

To further support these efforts, the NWG proposes sensible improvements to the Behavioral “Core” and the research IT infrastructure (including Linux support), the addition of brain and retinal imaging, and the planned Biobank that would link Upstate patient samples with patients’ EMR.

- The top level of investment is a strategic expansion of the faculty, designed to strengthen research and bridging basic and clinical science. Initial steps in this direction include the planned recruitment of two scientists to the Nappi Longevity Institute, the proposed recruitment of three Empire Innovation Program (EIP) joint faculty members in OVS and Psychiatry/Neurology, and of one EIP Neuro-oncology specialist in Neurosurgery. The NWG views the recruitment of a Chair for the Neuroscience and Physiology department as a critical component of this growth. Additional strategic hires were envisioned for continued improvement of computational capabilities in AI, machine learning and bioinformatics, and for reestablishing research neuroimaging (MRI, fMRI and CAT). In these latter areas, investment in equipment without thoughtful, targeted hires would not be useful. In sum, a thriving, integrated research community of basic, translational and clinical scientists cannot be developed without a sustained commitment to hire in the most promising areas of clinical and translational research.

As a final note, the NWG appreciates this opportunity to provide faculty-level input into the strategic planning process. The group recognizes the challenging circumstances in which this planning is being done and has realistic expectations for what is achievable in the near term. At the same time, the NWG recognizes the value of having a more integrated neuroscience community with a shared strategic plan, and hopes that the leadership will make every effort to support the finalized plan in a transparent and collaborative manner.

1. Our Current Strength & Resources

The Neuroscience research community at Upstate includes 40 faculty, 30 of whom have primary appointments in the departments of Neuroscience and Physiology, Ophthalmology and Visual Sciences, Psychiatry and Behavioral Sciences, Neurosurgery, and Neurology. This community has national recognition in the areas of psychiatric and vision research, with corresponding faculty research foci in both neurodevelopmental disorders and neural degeneration. Neuroscience is an integrated research community with most of the laboratories occupying the NRB-IHP building, sharing common equipment, Core resources, educational curriculum and seminars. In addition to the research faculty, a large number of clinical faculty (physicians) in Neurosurgery, Neurology and Geriatrics devote time to clinical research, epidemiological studies and clinical trials.

The vitality of the neuroscience research community is seen not only in the number of faculty but also in the level of funding from federal and private sources. An analysis of currently active, direct NIH awards to SUNY Upstate shows 40% of the institution’s NIH portfolio as funding in neuroscience and 36% in awards to research faculty of the five neuroscience departments. The promise of the community is underscored by the 50% growth in faculty since the opening of the NRB in 2014.

See ADDENDUM for detailed descriptions of strengths and capabilities.

2. FUNDING TRENDS

- Analyze funding trends over the last 5 years (data will be provided) and extrapolate to characterize the opportunity space around future funding trends

Overall, the Neuroscience (NS) community is reasonably well-funded from federal and foundations sources. Currently, 67% of the research faculty from the five NS departments, (Psych; OVS; N&P; Neurosurgery; Neurology) has active extramural funding. Efforts to increase funding are in progress in all departments. An analysis of currently active, direct NIH awards to SUNY Upstate shows 40% of the institution's NIH portfolio as funding in neuroscience and 36% in awards to research faculty of the five NS depts.

Expected areas of increased investment by major funders (e.g., NIH and other federal agencies) include:

- Aging research (Alzheimer, Parkinson's, dementia, etc.)
- Animal models: studies of disease, development, neurocircuitry, nervous system function from molecular mechanisms to systems level — in all models but with dedicated funding for NHP models
- Brain initiatives, including development and applications of in vivo imaging and recording technologies
- Neurorestorative research for CNS injuries and diseases
- Clinical Trials
- Regenerative medicine
- Tissue engineering and organoids

Additional areas of scientific interest with a narrower departmental focus include:

OVS: retinal regeneration; in vivo retinal and ocular imaging; bioengineering
Psych: suicide research; computational psychiatry

Neurosurgery and N&P: neuro-oncology, glioma; TBI early diagnosis and in-field assessments for DoD, sports
Neurosurgery: spinal cord injury and SCI therapies; novel drug delivery systems; stroke and CADASIL research; DBS (deep brain stimulation) therapy

3. DESIRED GROWTH

- Descriptions of new faculty hires that would:
- Amplify impact in your area;
- Fill missing expertise;

- Create bridges to other areas of strength at Upstate
- Recruitment by the NS departments will be guided by the following goals and principles:
 - To strengthen and complement existing research while introducing cutting-edge new approaches
 - To strengthen and complement existing research while leveraging existing valuable resources (e.g., Cores)
 - To fulfill a need linked to desired areas of investment at the level of new cores/resources (e.g., Biobank)
 - To seed cross-departmental collaborations
 - To create bridges with clinical programs to foster a more robust translational academic enterprise

Currently, three recruitment efforts that fulfil several of the above criteria are on hold:

- a) Geriatrics - Alzheimer's disease, leveraging support from the state, SUNY and a donor (CEAD; SNAP; Nappi Longevity Institute). A successful EIP proposal for the recruitment of two scientists to the Nappi Longevity Institute was awarded in 2019 and is currently on hold;
- b) Neurosurgery - Neuro-oncology, leveraging the Brain Tumor Biorepository. An EIP proposal for the recruitment of one faculty was submitted in 2019 and is currently on hold;
- c) OVS - Advanced retinal imaging and artificial intelligence, with specific focus on identifying retinal biomarkers in neurodegenerative/psychiatric disease. An EIP proposal for the recruitment of three faculty members in OVS with joint appointments in Psych or other neuroscience focused departments was submitted in 2019 and is currently on hold.

Other desirable areas of recruitment that fulfill one or more of the above criteria include:

- Cell and molecular neuroscience, electrophysiology, or systems — using cutting-edge approaches, such as optogenetics and neural prosthetics
- Bioinformatics/genomics/proteomics — leveraging and strengthening existing Cores (e.g., SUNYMAC and Proteomics Core)
- Computational biology, machine-learning, and AI
- Neuro-trauma (TBI), neuro-vascular, functional and structural brain imaging, or functional neurosurgery
- Scientific areas ideally suited for basic scientist-clinical faculty collaboration include: Drug screening and drug development; iPSC-based Disease models and Regenerative medicine; Neurorestorative therapy; Gene therapy; Tissue engineering; in vivo Ocular imaging.

- Descriptions of new instrumentation and core expertise that would further empower current and future faculty for success.

Investments in the following areas would result in significant improvements in productivity and grant funding:

a) Behavioral Core

There is a need for the current Behavioral Equipment unit to become a true Core, with funding for new equipment, maintenance, and for a Core leader to provide training. The current equipment is not sufficient to simultaneously run several mice in a given experiment (e.g., limited mouse fear conditioning boxes, operant boxes, and others). The current equipment should be evaluated to decide on upgrades and additions in order to ramp up capacity for these and other experiments. In addition, a major area for impactful investment lies in the addition of in vivo imaging/endoscopy in behavioral testing of rodents.

b) Ocular Imaging

The eye is a window into the brain and changes in retinal structure (vascularization, nerve fiber layer, among others) are correlated with various neurologic and neuropsychiatric disorders as well as predictive of visual disruptions. Advances in the technologies of in vivo ocular imaging have been dramatic in the last decade.

These technologies coupled with AI algorithms provide a powerful research modality. Current technologies on campus are solid for both animal models and human research, but further investment is needed.

In particular, Adaptive Optics Scanning Laser Ophthalmoscope (AOSLO), which affords high resolution imaging at the cellular level in the living eye, is missing and is a key component of the OVS EIP proposal. Another area for investment should be in optical coherence tomography with angiography (OCT-A) for both human and animal model imaging. Currently, we have on campus OCT capability for humans but not OCT-A; we have the first generation of OCT-A for animal work, but this needs replacement. The imaging modalities can be used to assess treatment efficacy or act as prognostic biomarkers for disease; and form the basic tools to assess treatment regimes

c) IT Infrastructure

The current IT infrastructure is mainly oriented toward Upstate's clinical and teaching mission. Although IT support is available to researchers, it is lacking in some basics such as support for Linux computers and shared storage space. In addition, security algorithms often hinder email communications and website access. Some solutions do not require additional costs (e.g., hiring IT staff with both Windows and Linux expertise).

Most critical will be to invest in technologies that support the processing and sharing of "Big Data". Advances in genomics (Single Cell Gene Expression, NexGen GWAS studies), super- and high-resolution imaging, and personalized medical regimens all require the collection, sharing, transfer, processing and storage of massive amounts of data. AI and deep learning protocols are rapidly advancing; serious investment in these areas is needed to keep our research enterprise merely current. These networks need to be safe and protected, but data transfer must be facilitated among users; thus, the one-hospital-fits-all protocols need to be emended.

d) Biobank linked to EMR

To be more competitive for NIH grants, it would be very useful to have a) easy access to the electronic medical record (EMR) for research, b) a Biobank to collect blood samples for genomic, transcriptomic and epigenomic studies, and c) a method to link EMR with Biobank data for bioinformatics analyses. This is a long-term plan that would likely require funding from SUNY Central but, perhaps, could be seeded by SUNY Upstate funding.

e) Tomographic imaging facilities

Development of a multi-year plan to provide access to tomographic imaging facilities at levels suitable for competitive funding — beginning with affordable, facilitated research access to the imaging facilities currently on campus (e.g., 3T magnets). The long-term goal is to develop a vibrant community of clinical and translational researchers (including new faculty hires) with access to modern tomographic imaging facilities (MRI, fMRI, CAT) and associated technical staffing for animal and human research projects.

4. FOSTERING COLLABORATIONS

- A draft strategy to engage, mentor and build collaborations with clinician scientists in your area in order to increase Upstate's translational research portfolio.
- A draft strategy to engage, mentor and build collaborations with early career faculty, fellows, residents and students.

A number of mechanisms will be used to support clinicians' engagement in research and to identify motivated residents, fellows and early career faculty. We recognize three major obstacles that must be overcome for the clinical faculty and their trainees (residents, fellows and students) to be able to succeed in research.

a) Protected time for research

Unanimously, the group believes that our current research efforts and those we propose here are greatly hampered by the lack of an academic culture in the hospital attending staff. This culture limits the students, faculty, and indeed, patients we attract to campus. Thus, Upstate must address key obstacles our clinical colleagues and their trainees encounter when trying to engage in research, including loss of compensation and lack of protected research time. Unless these issues are addressed by the leadership of the medical school and the hospital, our efforts to foster fully clinician–scientist collaborations will continue to be severely limited and SUNY Upstate cannot become a true academic medical center.

In addition to protected time for the Clinical faculty, students should have the option of taking one year off for research and work full-time in a lab before returning to, or graduating from, medical school. Indeed, OVS via the RPB foundation has a funding opportunity for up to two medical students per year to take time for a research project. This could be expanded by institutional funds to other areas. In addition, many Upstate medical students are finished with their studies in December or January of their fourth year — an elective fourth year research rotation could be incorporated into the curriculum. Similarly, there should be a path for residents and fellows to devote one to two years to research. (See also section 7.)

b) Communication

Communication within and across departments is key to integrating clinician and research faculty. A multitude of ways to address this issue have been proposed. The group will focus on developing the following ones:

- monthly seminars — each month one of our departments will present a research-focused seminar (possibility of tying this to Grand Rounds could be explored);
- workshops — occasional workshops centered around a single “clinical-scientific” topic of interest; workshops would be arranged to seed formation of collaborative teams and would be followed by submission of pilot projects for internal or external funding;
- biennial symposium — all researchers in neuroscience (faculty, residents, fellows, PhD program and medical school students, and staff) will come together to present their projects; location will be on campus or nearby (e.g., CNY Biotech Accelerator) to facilitate attendance by clinical faculty and trainees;
- research liaison adviser — each department will select one of their faculty to serve in this capacity, specifically to help create bridges between the clinical and the basic science communities;
- web-based, searchable Neuroscience Research Database — this will provide a site for clinical and basic science researchers, as well as newcomers, to find information on research expertise and active projects, helping identify matches.

c) Funding

Identifying sources of funding for collaborative research efforts is key to their success. Internal sources will include the institutional Pilot Project program (VPR office) and the new pilot program proposed below. In addition, early career clinical faculty and residents qualify for K08 awards (Mentored Clinical Scientist Research Career Development Award), which provide 75% protected time for research. Leveraging these funding mechanisms may help bring more residents/fellows/faculty into research for extended time (three to four).

We are committed to developing a “Neuro Pilot-Project Program” to specifically fund clinical- basic scientist collaborations in neuroscience. A number of issues must be addressed (including source and amount of funding, allowable expenses, project evaluation and supervision, etc.), but central to this program:

- the collaborative team must include a clinician (MD) and a scientist (academic researcher) faculty, though need not be necessarily inter-departmental;
- the project must include a plan to secure NIH or other extramural funding; possibly starting with smaller grants (R03 or R21) and aiming for an R01 or equivalent clinical award.

d) Mentoring

The mechanisms for collaborative research described here will also establish structured and unstructured mentoring relationships between senior faculty and early career faculty, fellows, residents and medical students. Mentors will emerge, in part, from the clinical-basic scientist pilot projects. Mentors will include faculty collaborators, project-reviewing scientists, and assigned project mentors/supervisors. Residents, fellows and students working on these projects will have mentors with both clinical and research expertise; additional faculty mentors will be identified, if needed. We expect that most of these mentoring relationships will continue beyond the time of structured interaction. As an added form of integration, clinical faculty and residents will be asked to participate in graduate-school teaching in their area of expertise (e.g., one clinical lecture or discussion related to a topic covered by the course).

5. HEALTH EQUITY RESEARCH & DIVERSITY

Commitment to diversity is not and cannot be a separate program. It must be incorporated into the very fabric of the Upstate Medical University community, and thereby impacts all research activities at Upstate. Here we will discuss the commitments and opportunities that are specific to our focus group. It is important to recognize that several on the NWG are recognized in their respective academic communities for their commitment to promoting diversity. Yet, among the NS depts, only OVS has been successful at recruiting a more diverse faculty; currently, five of 11 faculty are women, two are Latinx, and one is LGBT.

We discuss here three areas: diversity among faculty, trainees, staff and students; diversity among patients enrolled in clinical studies; and, then finally research and study of Health Equity in Neural Sciences. They will be discussed in that order.

a) Diversity in our Neuroscience Community

We begin with the understanding that diversity improves organizational performance and have better decision-making outcomes with longer-term success. Similarly, students and academic pursuits thrive in a more diverse environment. Thus, diversifying our faculty, student body and staff is not only a social and moral imperative, it is a pragmatic choice as well. We also refer here to a range of diversity including race, religion, national origin, gender identity, sexual orientation, as well as economic status, henceforth referred to as women and under-represented minorities (URM).

Achieving diversity requires a pro-active commitment to recruitment and creating a welcoming and affirming environment. Our institution has recently increased its efforts to address this challenge. Thus, in addition to adhering to state practices in hiring (e.g., targeted advertising, implicit bias training, and recruitment data tracking), we have been asked for one faculty in each department to serve as Diversity Officer and to work together with our recently appointed Chief Diversity Officer, Daryll Dykes, MD, PhD, JD, on a mandate to identify and implement ways to make tangible progress. A recent report of the 2020 Diversity Task Force thoroughly addresses mechanisms for external and internal hiring, and promotion of an inclusive environment.

Whereas we can apply best practices in integration and retention of women and URMs in our academic world, we must acknowledge the considerable challenge we face in recruiting URMs graduate students, technicians, and postdocs to our labs, and women and URM faculty into our departments. Retention of

women in the academic workforce is also of critical interest. Success in creating a diverse community requires identifying and removing unconscious bias, prejudice and “isms” in our everyday interactions, but to bring about fundamental change we need to invest in creating the pipeline that can lead us to become a diverse community at all levels of our professional hierarchy.

Hence, we propose that our institution establish a dedicated position, within the offices of the Dean of the Graduate School and the Vice President for Research, with the mandate to coordinate outreach and develop strategic pipelines targeting URM high school students, college students, college graduates (to works in labs pre-graduate studies), and potential post-graduate trainees and faculty. In response to such commitment, we will pledge our individual lab resources, our expertise, and our experience to support this institutional effort.

We view three approaches as key for success.

First, starting at the level of high schools and colleges, we must create strong pipelines for the advancement of women and URM:

- by working with Syracuse high schools to incorporate teachers and URM students into our outreach
- by developing summer research programs for STEM-focused URM high school students
- by networking with the Haudenosaunee to reach their high school and college students
- by reaching out to regional Community Colleges, e.g., OCC, to showcase opportunities for talented URM students
- by networking within the SUNY and CUNY undergraduate systems (both of which have URM programs) to populate our Master level and PhD level programs
- by leveraging our Summer Undergraduate Research Fellowship (SURF) program to pro-actively bring URM students to our campus
- by networking with historically black colleges for recruitment of their graduates into our programs.

Second, we must build strong relationships with organizations that represent these communities in order to be in the best position to mentor and promote the future careers of our women and URM, as well as to leverage these resources when recruiting at the level of post-graduate trainees and faculty. Organizations such as:

- the Rabb-Venable Excellence in Research Program — A division of the National Medical Association, this research award program in Ophthalmology promotes the career development of African-American and Caribbean-American physicians

- professional societies with pro-active diversity programs, that serve women and URMs as they seek to transition into postdocs and faculty positions
- Nth Dimensions — A non-profit, Nth Dimensions was founded by Dr. Bonnie Mason, an orthopedic surgeon, with the purpose of increasing the presence of URM surgeons in the field. Today, Nth Dimensions offers pipeline programs for women and URMs to enter several competitive specialties.

Third, we must leverage diversity resources accessible through our federal funding agencies. For instance, NIH supports many specialized programs for decreasing the disparities in URM representation in health research. These mechanisms run the gamut from individual training grants for suitable candidates to administrative supplements to be used to support URM fellows at all levels, from post-baccalaureate to faculty. OVS PIs have been particularly successful in using this mechanism to recruit suitable candidates at post-bac, postdoctoral, and entry faculty levels, through diversity and re- entry supplements.

We (Brunken, Pignoni, and Faraone) will gladly work with faculty to help them leverage their existing R01s to expand our pool of minority staff. These diversity and re-entry supplements require only administrative review at the funding NIH institute, and there is considerable funding for this purpose.

We also call for Upstate to follow through on these efforts by securing funding for awards dedicated to the career development of our URM faculty, postdoctoral fellows, doctoral students and staff. Such programs are very likely to have strong philanthropic potential.

b) Compliance with Directives for Diversity in Human Research Subject

In all human subjects' research, NWG will be fully compliant and pro-active in assuring a diversity of human subjects. For example, some of the studies underway in the Psychiatry department have relatively high enrollment (25%) of African-American patients. Proactive outreach will be expanded to include outreach to area houses of worship; civic organizations; school districts and the like. Each of these types of organizations have constituents that can be targeted for inclusion into our studies; for example, in Brooklyn, glaucoma screenings in community-based organization in urban neighborhoods increased enrollment in our patient programs and clinical trials. This experience has been replicated across specialties. Institutional resources at the departmental and programmatic level will be needed to promote these outreach programs; they can include medical students, resident time, and staff in the Office of Community Outreach/Relations. There is NIH funding for such outreach; indeed, an extramurally funded program exists on campus to increase diversity in recruiting older adults into clinical trials. Seeding such outreach will make similar proposals more competitive.

c) Health Equity Research

Patient-centered outcomes research is an ongoing area of interest and indeed the federally supported Patient Centered Outcome Research Institute (PCORI) has a large and growing budget. The diseases associated with our research efforts are all strong candidates for PCORI support. While several recent awards have been made to Upstate faculty including one to NWG faculty, there is limited expertise in the NWG in this funding arena and research area. Nevertheless, the group sees these funding mechanisms as an important stream to support important and vital outcomes research.

There is an ongoing research effort in the Neurosurgery Department examining the relationship between post-operative surgical site infections, hygiene and socioeconomic conditions. Elaborating possible interventions through community-based support groups to address this problem would be a worthy effort and make for an excellent PCORI proposal. Such an effort could serve as a model for further health equity concerns.

There are considerable NIH and PCORI resources to support some of the programs identified above (a –c). However, to effectively compete for these funds, Upstate Medical University must support the development of dedicated infrastructure and relevant expertise. This means hiring grant advisors or writers with experience in these areas in order to grow a critical mass of experienced faculty and PIs in the region. These programs are likely to generate big data and require the computational support requested in this report. In addition to fulfilling our mission, as a public university, to serve the public interest, these activities, if engaged in with excellence, can generate a robust stream of grant and philanthropic funding.

6. ASPIRATIONAL GOALS

- Describe five aspirational goals in your area that could be achieved in the next 5-10 years.

New funding mechanisms:

Based on communications with Dr. J. A. Gordon (NIMH Director) and Dr. J. D. Jentsch (SUNY Binghamton Professor with extensive P50 experience), as well as an analysis of 2019 P01 and P50 NIMH awards, the consensus is that Upstate lacks the critical mass of funded investigators required to obtain these grants.

Regarding S10 funding, this is well within reach of the Upstate community. Previous awards attest to this, and an S10 application for a Leica Stellaris Confocal with FLIM (a collaboration among NS depts) is currently pending. Hence, the NS community will focus on two other funding mechanisms for its aspirational goals:

a) 'Large' multiple-PI grants (MPI R01)

The NS depts will facilitate formation of cross-departmental interest groups that are competitive for larger MPI grants of approximately \$500,000 (regular MPI awards, of approximately \$200,000 to \$300,000 in direct costs, are already accessible to our PIs). Once a strong record of collaboration on large MPI grants has been established, it may be possible to consider center-grant or project-grant applications.

b) Institutional training grant (T32 or T35)

OVS has previously submitted a T32 pre-/postdoctoral training grant application. It was reviewed somewhat favorably. While some of the concerns can be addressed at the departmental level. There are clear obstacles to funding that involve institutional weaknesses, e.g., very low number of individual training grants (F31, F32) and somewhat limited applicant pool. Nonetheless, OVS plans a resubmission as early as May 2021, for the next once-per-year deadline. A Neuroscience T32 grant submission will be considered in light of the experience by OVS. If unsuccessful, a strategy to improve our competitiveness will focus on T35 and F31-F32 applications. A T35 (short, two to three months, medical student research) and F31-F32 fellowships (pre-/

postdoctoral NRSA) will help us build a robust track record in training and institutional grant administration. Summer research opportunities in NS departments are already available to medical students and lay a good foundation for a T35 application. OVS has a funding mechanism for short-term medical student training provided by Research to Prevent Blindness that can be used to build a track record for institutional funding as well.

New research areas:

For a relatively small research community such as ours, critical to developing a high profile is the ability to identify and pursue research in areas of great future impact, and to do so with well positioned partners and in synergistic ways. The NS community is committed to focused efforts in a few key areas and to establish strong partnerships with surrounding institutions.

a) Retinal Regenerative Medicine

Stem cell technologies combined with bioengineering principles, and organoid technologies are rapidly expanding fields that hold the promise of applying novel approaches and innovative solutions to the treatment and cure of human diseases. Indeed, the generation of both self-organizing retina and cortical organoids from embryonic stem cells has led the way to develop high-throughput models of disease-specific organoids for therapeutic testing. Moreover, the ability to produce biomimetic scaffolds, and consequently replacement tissues, open the possibility for replacement of diseased tissues where conventional transplants are not possible. Upstate's proximity to SU and the BioInspired Institute offers a great opportunity for cross-institutional collaboration in this cutting-edge research; additionally, nearby SUNY Poly is another important partner in this area. OVS has made a significant investment in these fields by recruiting two additional faculty to add to several of our developmental stem cell biologists. A few additional faculty along with further infrastructure support would be prudent to stabilize this important area.

b) Marmoset project

The establishment of marmoset genome-editing capabilities at Upstate (currently a project based in the Department of Neuroscience and Physiology) is a major undertaking of great benefit to research at Upstate in general. Given the strength of the marmoset model for the study of mental disorders and eye diseases, diagnostic retina imaging, and social behavior, there is much interest within the NS community in achieving this goal. Notably, when the director of NIMH visited Upstate last year, he identified marmoset research as one of his high-priority areas, and Upstate's first two marmoset-based grants were awarded to the institution by NEI. The five NS depts will explore ways to help bring this project to completion. This is one of the areas where productive collaborations can be developed with faculty from across the NS and other departments, based on carefully designed and well-orchestrated pilot projects using this NHP species.

c) Collaborations

SUNY Upstate is ideally located within NYS to serve as a collaborative hub, and the Upstate NS community is committed to fully develop its potential as a major scientific partner and intellectual center through

collaborations developed locally and across NY state. Opportunities that have materialized or have potential, and will be further developed, include:

- Collaboration on machine learning projects between Upstate and SU Computer Science faculty; currently pursued by Psychiatry and OVS;
- Collaborations with the Syracuse VA, which is also a relatively untapped source of funding. A few faculty members (in OVS and Neurosurgery) have successfully joined the VA and secured VA Merit funding; their experiences can help pave the path for further integration. In addition, this expansion not only increases the revenue stream to Upstate, but also brings increased revenue to the Syracuse VA, therefore doubling the impact on the regional economy.
- State-wide, the work on marmosets offers great potential for intra-SUNY collaborations, particularly with SUNY Downstate and SUNY Optometry.
- The SUNY Eye Institute represents a network of cross-institutional collaborations that can be harnessed for clinical, translational and research purposes. The failure of the SUNY central administration to support this effort is a prime example of lack of vision. More regionally focused networks are emerging and should be supported for their translational potential.
- Partnerships with startups and companies provide opportunities for collaborative projects and investigator-initiated studies, as shown by examples in Psychiatry and Neuroscience and Physiology. Strengthening of this entrepreneurship will help define Upstate as one of the go-to institutions for development of therapies and medical diagnostics.

7. OTHER WAYS TO MOVE THE NEEDLE

Our research labs are graduate-student driven. More postdoctoral researchers would do much to enhance our research efforts. In addition, compared with previous generations, current medical students and trainees are less likely to appreciate the importance of, and consider a career in, research. Upstate should do its part in reversing these troubling trends by facilitating recruitment at the postdoctoral level and by recruiting academically-minded medical students and trainees.

A stronger national/international profile would obviously help with recruitment in both clinical and research departments, and would also benefit SUNY Upstate clinical services as strong research programs reassure patients that the institution is operating at the cutting edge of medicine. Ways to achieve this goal at the level of the institution and neuroscience include:

- Improving websites and social media presence to raise the profile of SUNY Upstate;
- ‘Branding’ of Upstate Neuroscience as a leader in neural and visual sciences;
- Sponsoring of national/international symposia/conferences to be held at Upstate or locally;

- Elevating the profile of Upstate Neuroscience locally and community giving for our programs.
- Leveraging international agencies for funding and leveraging overseas ties of our faculty to recruit high-quality graduate students and postdocs (this requires a dedicated effort with GS staff involvement).

Shorter-term ways to address challenges in recruiting outstanding students and to foster an academic mindset among all of our clinical trainees include:

- Creating a funded program for medical students seriously interested in research, through which they can spend a full year in a research lab during their medical degree (one year of financial support);
- Creating a path for clinical trainees (residents and fellows) to devote one to two years to research, with the option of coupling research training to a Master's degree (e.g., the physiology Master program of N&P is ideally suited for such an endeavor);
- Creating more funded slots for MD/PhD students.

Such programs will set Upstate apart from other institutions and attract outstanding, science-minded applicants.

Addendum: OUR CURRENT STRENGTHS & RESOURCES

- A concise narrative describing current strengths and capabilities (narrative)

The Neuroscience research faculty at SUNY Upstate comprises 29 assistant/associate/full professors from the departments of Neuroscience and Physiology (eight; plus, one with joint appointment in Neurosurgery), Ophthalmology and Visual Sciences (nine), Psychiatry and Behavioral Sciences (seven), Neurosurgery (three), and Neurology (two). All labs, but one, are located on two floors of the IHP-NRB building (28 labs), and constitute an integrated research community that shares equipment, core resources, and has experienced 50% growth in faculty since the opening of the NRB in 2014.

The NRB also houses the Neuroscience PhD Program, which includes nine additional faculty from the departments of Cell and Developmental Biology (one), Biochemistry and Molecular Biology (two), Pharmacology (two), Microbiology and Immunology (one), Physical Therapy (two), and Pediatrics (one).

In addition to the research faculty, a large number of clinical faculty (physicians) in Neurosurgery and Neurology devote some time to clinical research, epidemiological studies, and clinical trials. Better integration of this faculty would greatly enrich the Neuroscience community. One major obstacle is the lack of protected time; other obstacles include the lack of avenues for interaction and of resources for collaborations.

The environment of each department and the community as a whole is supportive, collegial, liberal, and collaborative. Each department has individual strengths that can be further leveraged to increase funding, productivity, and to overall strengthen the SUNY Upstate Neuroscience community.

The Department of Neuroscience and Physiology carries out research in models of neurodevelopment and neurodegeneration with direct relevance to autism, schizophrenia, intellectual disability, fetal alcohol syndrome, brain tumors, and retinitis pigmentosa. This research focus underlies strong ties with the Departments of Psychiatry (schizophrenia, autism, neural circuit development), Ophthalmology (retinal degeneration, neural regeneration, and neural extracellular matrix) and Neurosurgery (Dr. Daniel Tso's vision research in primates). Faculty are also involved in external startups and industry, including Dr. Frank Middleton's work with Quadrant Bioscience on a diagnostic test for autism and on Covid-19 detection, Dr. Eric Olson's efforts in gene therapy, and Dr. Mariano Viapiano's in brain cancer therapeutics.

The research topics in the Research Division of the Department of Psychiatry and Behavioral Sciences range from psychiatric genetics to cellular molecular neuroscience. Most PIs have excellent vision within represented fields, which translates into being competitive for external funding. Within its small and close-knit community, investigators know each other and have developed several intra-division collaborations, some of which are instantiated in multi-PI grants.

Innovative methods abound. One outstanding strength of the division is the concentration of genomics, transcriptomics and epigenomics expertise, which have led to many productive collaborations. We have trained junior faculty who are adept in bioinformatics and machine learning; this has allowed us to stay on the cutting edge of these fields by developing novel methods. Another strength of our division is the focus of many of our faculty on clinical research that includes studies of attention deficit hyperactivity disorder, schizophrenia, bipolar disorder, post-traumatic stress disorder, autism spectrum disorder, frontotemporal dementia and Alzheimer's disease. We also have faculty studying a) the reciprocal impact of emotional factors (e.g., depression, anxiety), on diabetes health outcomes, and of diabetes on mental health outcomes; b) decision making process and c) learning diathesis models for mental health issues such as anxiety disorders, post-traumatic stress disorder and major depressive disorder. Furthermore, basic science projects in the division are also in the forefront of the neuroscience field, focusing on how psychiatric diseases damage brain cells and their proper wiring, and how these impairments cause mental illnesses, how genetic variants impact gene expression, protein abundance and various levels of regulatory networks, and how the cellular and molecular mechanisms caused by experiences is coupled to modifications of neural circuits that lead to long-term behavioral changes. The RD has an international footprint that includes international funding, international collaborations and invitations to speak at meetings around the world.

The Department of Ophthalmology & Visual Sciences (OVS) is a highly collaborative department with a very strong focus on the retina using distinct, but complementary approaches. The OVS research faculty is 42% female; 17% Latina/o; 8% LGBTQ. This diversity provides great decision-making processes that reflect a full range of possibilities. The faculty is also diverse relative to the stage of their careers – one third each Assistant Associate and Full Professors again affording a full range of youthful energy and solid experience. The commitment to shared mentoring is reflected in weekly PI meetings where the faculty discuss in depth grant applications and provide detailed substantive, but supportive, critiques before applications go out. OVS research comprises 11 faculty with primary appointments, and two in other Neuroscience departments, with joint appointments in OVS. Research foci include:

- (1) Cellular and Developmental Biology of the Retina,
- (2) Physiology and Biophysics of the Retina and Central Visual System,
- (3) Diseases and Pathology of the Eye and their Potential Therapies.

Within this, OVS has assembled a new research team focused on glaucoma and an emergent team working on neovascular diseases of the retina. OVS benefits from strong internal and external collaborations: internally with N&P, Neurology, Neurosurgery, Biochemistry, and Cell and Developmental Biology. Externally, the department collaborates with SUNY Polytechnic Institute, SUNY Downstate, and SUNY Buffalo through the SUNY Eye Institute, a consortium of researchers across the SUNY system. Outside of SUNY, the faculty have extensive collaborations locally with Syracuse University via the BioInspired Institute, as well as nationally and internationally. Over the past five years, OVS funding has moved from 47th to 34th in the NIH rankings of Ophthalmology departments (per the Blue Ridge Institute). Our faculty have a 90% rate of extramural funding.

The Department of Neurosurgery has a decades-long institutional and national history of strengths and commitment to research. The department engages primarily in translational or potentially translational research on traumatic brain injury, glioma, spinal cord injury, stroke, CADASIL (the most common form of hereditary stroke and vascular dementia), Alzheimer's disease, Parkinson's disease, the CNS connectome (particularly in NHPs), and novel drug delivery mechanisms. Neurosurgery has the unique ability to access the living human brain and CNS, enabling the development of novel solutions and therapies to important clinical problems. The department's Brain Tumor Biorepository is an invaluable resource for Neuro-oncology research.

The Department of Neurology has a robust clinical trial portfolio reflecting extensive experience and well-established clinical trial infrastructure, including the NeuroNEXT and Platform Clinical Trials. The faculty expertise in neurodegenerative diseases (Alzheimer's, Frontotemporal, Lewy body dementia, Parkinson's disease, etc.), autonomic dysfunction, neuro-ophthalmology, neuromuscular disorders, epilepsy, multiple sclerosis and neuro ICU offers opportunities for translational collaborations with access to clinical cohorts.

The Department of Geriatrics hosts a NYS Centers of Excellence for Alzheimer's Disease and leads the SUNY Network Aging Partnership (SNAP), a research alliance among the four SUNY academic medical centers. Through these efforts, SUNY Upstate is developing the largest clinical program for AD and other dementias in the region, and a major center for related clinical trials (three trials for AD drugs currently with others pending). The establishment of the Nappi Longevity Institute and the awarding of two EIP faculty positions, one for a basic scientist and one for a translational/clinical scientist, further strengthens research in Alzheimer's Disease.

- A list of technical capabilities, both through personnel expertise and specialized instrumentation

The following instrumentation resources are available to all faculty:

- SUNYMAC Genomics Core (institutional core with expert staff–assisted by N&P)
- Neuroscience Imaging Core, previously AFIC (N&P departmental core with expert staff)
- NRB Common Equipment (committee chaired by Neurosurgery/N&P)
- Electrophysiology and Cell Culture (N&P)
- NRB Behavioral Equipment (committee chaired by Psychiatry)
- SD-OCT Spectral Domain Optical Coherence Tomography for Animal Models (OVS)
- GPU computer (Psych)

The Neuroscience faculty and personnel share their expertise in the following areas:

- Autonomic testing
- Behavioral assays
- Chemogenetics, Optogenetics, and Pharmacogenetics
- Clinical studies
- Cranial window implantation (rodents, non-human primates)
- Electrophysiology
- in vivo Electrophysiology, single-unit multi-electrode recordings (rodents, NHP, human patients)
- Epidemiology
- Genomics
- GWAS
- Identification of exosome function
- Imaging: calcium imaging; in vivo animal models multi-photon microscopy; Optical Coherence Tomography (SD-OCT); Optical functional imaging of retina/neocortex; stereology; confocal microscopy; FLIM, FRAP, FRET, STED microscopy; in vivo animal imaging
- Intra-operative monitoring of CNS function
- Lab-oriented computer programming and interfacing
- Machine Learning and Deep Learning; Model systems
- Drosophila, Xenopus, zebrafish, mouse, and marmoset model systems
- Stem cell biology and pathology, pluripotent stem cells (iPSCs)
- TMS (trans-cranial magnetic stimulation).



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