Annual Update: Research and Programs

2014–2015

Mount Sinai

Seaver Autism Center for Research and Treatment

seaver autism center
for Research & Treatment at Mount Sinai

seaver autism center for research & treatment @ mount sinai

The Seaver Autism Center for Research and Treatment was founded in 1993 through the generous support of the Beatrice and Samuel A. Seaver Foundation (Hirschell E. Levine, Esq., and John D. Cohen, Esq., Co-Trustees).

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Mission Statement

The Seaver Autism Center for Research and Treatment is a fully integrated and translational center dedicated to discovering the biological causes of autism and developing breakthrough treatments. Our mission is to prevent and cure autism by bridging the gap between new discoveries at the basic science level and enhanced care, with the subsequent translation to the community of new and improved approaches to caring for people with autism.

Community Partnerships

American Museum of Natural History

The Association for Metroarea Autistic Children (AMAC)

Hebrew Educational Society

Jewish Board of Family and Children's Services (JBFCS)

The Jewish Community Center (JCC) in Manhattan

Samuel Field / Bay Terrace Young Men and Young Women Hebrew Association

Shorefront YM YWHA of Brighton-Manhattan Beach

United Jewish Appeal (UJA)-Federation of New York

Westchester Jewish Community Services (WJCS)

YAI Network

Cover art by Jessica S. Johnson, MFA

Seaver Autism Center Leadership

Message from the Director

As the Seaver Autism Center enters its 22nd year, we are continuing to grow and conduct groundbreaking research. As a fully integrated clinical and research center with a scope that is akin to a small (and growing) clinical department, the Seaver Center has as its top priority the translation of preclinical findings into the clinic for improved treatments and interventions for individuals with autism spectrum disorders (ASD). To that end, we continue identifying causes of autism, which we then use to develop model systems. We use these systems to identify and study novel therapeutics, and we carry positive results through to clinical trials and ultimately improved treatment.

This year four major papers led by the Seaver Center on the genetic etiology of autism were published, which are described in further detail in the "Research Program" section of this booklet. Together, these four papers have elevated the field of autism genetics and determined its direction for the foreseeable future. Researchers in our group continue to publish in high-level journals, with over 40 publications in the past year and 115 within the past three years. In 2014, the journal *Molecular Autism,* co-founded and co-edited by Dr. Simon Baron-Cohen and myself, received its first Impact Factor (IF) of 5.486, which represents the highest IF for any journal dedicated to autism or related neurodevelopmental conditions. Notably, all four National Institutes of Health (NIH) grants we submitted in the fall of 2013 were recently funded. These grants span several areas, including genetics, animal model systems, epidemiological, and clinical research. With this support we are better able to conduct research that will ultimately improve the lives of those affected by ASD.

As always, training and education are an ongoing goal for the Seaver Center. The Training Program at the Center spans all areas of research and clinical work, and it encompasses trainees at all levels, including (in 2014) three junior faculty fellows, five interns and externs, eight postdoctoral fellows, seven graduate students, and two medical students. The Center's Outreach Program, which aims to educate the community and disseminate research findings, continues to host several dozen lectures for families and researchers, several monthly Seaver Seminars, the Distinguished Lecturer Series, and the Annual Advances in Autism Conference (now in its 19th year). In 2014 we also saw the launch of the Seaver Autism Center Associates Committee, a group of committed stakeholders who want to help define the direction of the Seaver Center.

It is an important and very exciting time for preclinical and clinical research in autism, and we hope you will join us on this critical journey.

Joseph D. Buxbaum, PhD
Director

ALEXANDER KOLEVZON, MD, CLINICAL DIRECTOR AND JOSEPH D. BUXBAUM, PHD, DIRECTOR, SEAVER AUTISM CENTER

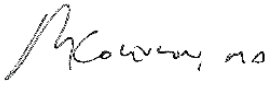
Message from the Clinical Director

This past year has been very exciting for the Clinical Research Program at the Seaver Autism Center. We have been increasingly focused on using genetic discovery and single gene causes of ASD to understand ASD broadly and to develop new treatments.

Our group has taken the lead in organizing an international consortium of researchers dedicated to understanding Phelan-McDermid syndrome, a rare disease that causes ASD. We recently received funding from the NIH for a project focused on Phelan-McDermid syndrome as part of a Rare Disease Clinical Research Network that was formed across sites from all over the United States. The Seaver Autism Center is also conducting the first and only clinical trial of a novel therapeutic in this syndrome in the United States, another federally funded project. We were thrilled to release preliminary positive results from the pilot trial of insulin-like growth factor-1 (IGF-1) in Phelan-McDermid syndrome at the end of this past year in *Molecular Autism,* and a larger trial is now underway.

After many years of preparation, we have also begun a national Study of Oxytocin in Autism to improve Reciprocal Social Behaviors (SOARS-B), funded as part of the NIH Autism Center of Excellence grant mechanism. We believe when SOARS-B is finished, we will be able to definitively answer the question of whether oxytocin is effective in ASD, and if so, which children and adolescents are most likely to benefit.

The past year has been filled with success and challenge, and our team remains extremely invested in trying to drive the field forward by developing new treatments and to improving the lives of people and families affected by ASD. As always, we are extremely grateful to all the families who participate in our studies, to the Seaver Foundation, and to all the organizations who sponsor our work.



Alexander Kolevzon, MD
Clinical Director

Research Program

The Seaver Autism Center continues to grow as an integrated clinical and research center for ASD. With more than 40 publications in the past year and 115 within the past three years, the Seaver Center conducts and publishes research at the forefront of the field in high-level journals, including *Nature*, *Nature Genetics*, *The Journal of the American Medical Association*, *Proceedings of the National Academy of Sciences USA*, the *American Journal of Human Genetics*, *Public Library of Science Genetics*, and *Molecular Autism*.

Integrative Research

The Seaver Autism Center takes a unique genetics-first approach in ASD, which allows for highly coordinated preclinical and clinical studies. A major focus of the Center is Phelan-McDermid syndrome (PMS)/22q13 deletion syndrome, one of the more common single gene causes of ASD. At the Seaver Autism Center, we use a highly translational approach: we study patients with PMS, model PMS mutations in experimental models, and design and test novel pharmacological compounds based on study results in the experimental models.

The behavioral and neurological features of PMS are due to mutation of the SHANK3 gene. Data indicate the SHANK3 pathway can be altered in ASD, even without a mutation in SHANK3. We aim to uncover the biological processes that are altered by SHANK3 mutations, so we can pharmacologically target these processes and alleviate the symptoms of the disorder. A powerful strategy to study the mechanisms underlying a disease entails the use of model organisms. Our preclinical research team is using both mice and rats carrying engineered mutations in SHANK3 as a model for PMS and for ASD. The consequences of SHANK3 deficiency in these models are then examined with a multidisciplinary approach, which includes molecular and cellular biology, electrophysiology, behavioral analyses, and neuroimaging. These analyses provide detailed knowledge of the biological changes that occur with the loss of SHANK3. This in turn identifies lead compounds for drug discovery that can be tested in the mouse or rat.

The clinical research team has translated findings from these preclinical models into experimental therapeutics for individuals with PMS. First, exciting results with Insulin-like Growth Factor-1 (IGF-1) treatment are reported below. As part of these studies, the clinical research team applies both neuroimaging and electrophysiology to investigate the effects of SHANK3 mutations on brain structure and function in humans. These studies also aim to identify biomarkers that can be used as outcome measures to evaluate the effects of behavioral or pharmacological forms of intervention. Moreover, through a joint effort by the preclinical and clinical research teams, we are collecting blood samples from subjects with PMS that can be used to derive nerve cells and to create a personalized experimental model for each patient. These models are an unparalleled tool for preclinical research and provide an exceptional preclinical model for drug development and screening.

More details about both the preclinical and clinical studies around PMS are described on the following pages.

Genetics

In 2014, Seaver Center investigators completed four major research studies, among others, on the genetic etiology of ASD, and the papers that came out of these studies represent the state-of-the-art in autism genetics for the foreseeable future.

The first study, entitled "Convergence of genes and cellular pathways dysregulated in autism spectrum disorders," was published by Dalila Pinto, PhD, Assistant Professor of Psychiatry and Genetics and Genomic Sciences, and colleagues in the *American Journal of Human Genetics*. This study analyzed 2,500 families with autism in search of copy number variation (CNV), a type of genetic variation where part of a chromosome is abnormally deleted or duplicated, leading to the loss of one copy or the acquisition of an extra copy of one or more genes. This study has confirmed individuals suffering from autism have an increase in deletions and duplications of genes and demonstrated genes hit by CNV converge on cellular mechanisms related to the function and development of nerve cells.

The second study, entitled "The familial risk of autism," which was led by Avi Reichenberg, PhD, Professor of Psychiatry and Preventive Medicine, is the largest study on familial risk for autism to date, with over two million Swedish families analyzed. The results of the study, published in *The Journal of the American Medical Association*, have shown the risk of developing ASD increases with genetic relatedness, and over half the risk for ASD resides in genetics.

The third study, entitled "Most genetic risk for autism resides with common variation," led by Joseph Buxbaum, PhD, Director of the Seaver Center, was published in *Nature Genetics*. This study showed convergent evidence that genetic factors account for over half of the risk for ASD with the majority contributed by the combination of relatively common genetic variants in the population ("common variants"). The study was conducted by the Population-Based Autism Genetics and Environment Study (PAGES) Consortium which uses novel methods of analysis on a population-based epidemiological sample to evaluate the role of inherited and *de novo* (occurring in the egg or sperm) genetic variants in autism, while assessing key non-genetic variables.

The fourth study is the first genetic analysis by the Autism Sequencing Consortium (ASC), an international collaboration between over 30 research teams and co-led by Dr. Buxbaum. This study was published in *Nature* in November 2014. The study by Dr. Buxbaum and colleagues is the largest sequencing study to date, with the DNA of about 15,000 individuals sequenced and analyzed. Investigating rare mutations, the study discovered 33 autism risk genes and another 70 likely contributing to risk. The ASC has expanded to include over 20,000 samples and is currently carrying out five additional analyses of this large data set. The ASC makes all data available to qualified researchers.

Rodent Models

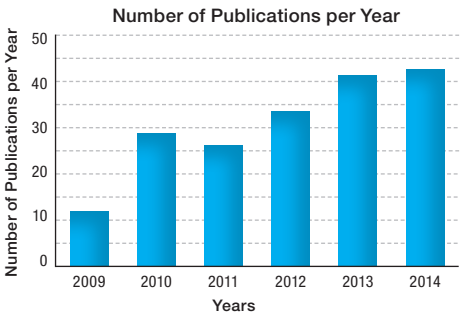
At the Seaver Center, researchers are characterizing mouse and rat models with mutations in several ASD risk genes, including SHANK3, FMR1, MECP2, and CYFIP1. These studies provide objective measures of the biological effects of the loss of these genes on nerve cell connectivity, strength of the communication between nerve cells (synaptic plasticity), and cognitive, motor and social behavior. Using this approach, we discovered

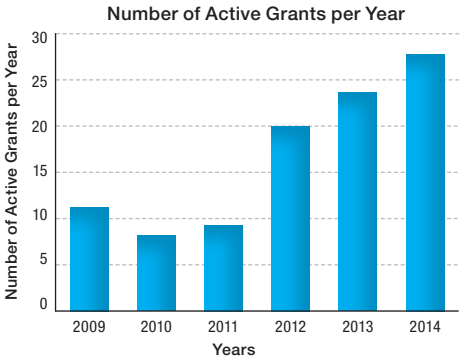
that treatment of SHANK3-deficient mice with IGF-1 ameliorates some synaptic plasticity and motor deficits. These findings have led to clinical trials testing the effects of IGF-1 in individuals carrying mutations in SHANK3.

Our most recent efforts are focused on rat models for ASD. Compared to mice, rats have additional advantages, such as more complex and humanlike neural circuitry and behavioral repertoire. Use of these models will help lead to a better understanding of the deficits in brain areas relevant to ASD and the development of new therapeutic approaches. Seaver Center researchers are characterizing the first rat model carrying a mutation in SHANK3. Similarly to the SHANK3-deficient mouse, the rat model displays synaptic plasticity deficits. It also exhibits attentional and social behavior deficits, recapitulating the neuropsychiatric features of PMS. Using this model, we have identified further medicines that are now being carried over to clinical trials in patients with PMS.

Induced Pluripotent Stem Cells

Seaver Center researchers continue to develop the use of stem cells in autism research. This model system is important for ASD because it allows us to study human nerve cell function in the context of autism genetic variation. In addition, stem cells can be used for gene discovery, using methods of systems genetics to look for disrupted molecular pathways for treatment targets. Lastly, stem cells can form the basis for intermediate- and high-throughput small molecular screening for new ASD medicines. To date, we have collected over 250 samples, from over 80 families, for stem cell research.





Clinical Research

Clinical research continues to span several areas, including experimental therapeutics, objective measures development, phenotyping, and neuroimaging.

Experimental Therapeutics

The Experimental Therapeutics Program was very active in 2014, simultaneously recruiting for six clinical trials with five different pharmacological compounds in children, adolescents, and adults with ASD, Fragile X syndrome (FXS), and PMS. In 2014, the Center enrolled 170 individuals for participation in treatment and clinical or genetic research protocols.

STUDY OF OXYTOCIN IN AUTISM TO IMPROVE RECIPROCAL SOCIAL BEHAVIORS

The Seaver Center is participating in the "Study of Oxytocin in Autism to improve Reciprocal Social Behaviors," (SOARS-B), a multi-site trial funded by the NIH Autism Center of Excellence grant mechanism. This trial will study 300 children and adolescents with ASD to assess the effect of treatment with intranasal oxytocin on reciprocal social behavior. Mount Sinai played an important role in organizing efforts around this project and is one of five sites in the network (with University of North Carolina; University of Washington; Vanderbilt University; Harvard University). This study will be a definitive treatment trial of oxytocin in ASD and aims to explore several moderators and mediators of treatment effects in order to better understand who is most likely to respond to oxytocin.

PILOTING TREATMENT WITH INSULIN-LIKE GROWTH FACTOR IN PHELAN-MCDERMID SYNDROME

Building on our studies of novel therapeutics in SHANK3-deficient mice (mice with a missing or mutated copy of the SHANK3 gene, one of the strongest genes for ASD), the Center finished a pilot trial in humans (n=9) with PMS. The results of this study provide evidence of safety and preliminary evidence of efficacy on the primary outcome measure and were published in *Molecular Autism* in December 2014. The Center has continued the IGF-1 trial in PMS beyond the pilot study, and we received funding from the NIH for this expanded study. By working with the pharmaceutical company Ipsen, we hope to expand the trials to multiple sites. In addition, we have received a pilot award from the Autism Science Foundation to help support a trial with IGF-1 in ASD more broadly.

ADDITIONAL CLINICAL TRIALS

Although collaborations with Hoffmann-La Roche using an mGluR antagonist in children, adolescents, and adults with FXS did not produce positive results, we remain committed to developing new treatments in FXS. We are now collaborating with Neuren Pharmaceuticals to study the effect of an IGF-1 derived peptide in FXS. The Center also has an ongoing study with Roche assessing a vasopressin 1a receptor antagonist in adults with ASD.

Phenotyping

As part of the Assessment Program, the Seaver Autism Center conducts comprehensive phenotyping on individuals with PMS (45+ families over three years). This work provided preliminary data for the Rare Diseases Clinical Research Network (RDCRN) grant awarded by the National Institute of Neurological Disorders and Stroke in September 2014, titled "Developmental Synaptopathies Associated with TSC, PTEN, and SHANK3 Mutations."

Dr. Kolevzon will lead the Phelan-McDermid syndrome longitudinal study as part of this RDCRN, and Dr. Buxbaum will act as Administrative Director of the RDCRN. This grant marks the first time the NIH has provided funding for the clinical and longitudinal assessment of PMS/SHANK3 mutations, which we now know to be a relatively common monogenic cause of autism. This study will comprehensively characterize the phenotype and natural history of PMS, identify biomarkers using neuroimaging, and identify genetic factors which contribute to diverse phenotypes in patients with PMS.

Objective Measures

In 2014, the Seaver Autism Center began to focus on the development of objective measures to address the urgent need for biomarkers of ASD that can be used to support diagnoses, evaluate treatment efficacy and predict treatment responders, particularly in severely affected populations. One especially important direction for the Center is developing assessments and treatments for the most severely affected individuals. Paige (Weinger) Siper, PhD, and Teresa Tavassoli, PhD, Seaver Fellows, have developed novel behavioral and electrophysiological assessments of sensory processing. The Seaver Autism Sensory Assessment (SASA) is a standardized clinician-administered assessment of sensory symptoms associated with ASD. A combination of clinical observation and parent interview quantifies sensory symptoms across visual, auditory, and tactile domains and is based on the Diagnostic and Statistical Manual-5 (DSM-5) criteria for ASD (hyperreactivity, hyporeactivity, sensation seeking).

We have also developed a novel application of an electrophysiological technique to gather objective, rapid and reliable measurements of early-stage visual processing in ASD. Our newly developed behavioral and electrophysiological assessments allow us to examine the relationship between observed behaviors and neural functioning and to determine whether these measures are ultimately linked to ASD severity, intellectual functioning, or associated symptoms. We are currently validating our newly developed measures in the context of ongoing clinical trials, and we are translating our methods to both additional sensory modalities and to existing animal models at the Seaver Center.

Neuroimaging

The Neuroimaging Program uses multiple imaging techniques to better understand the neural mechanisms underlying the core symptoms of autism.

NEUROIMAGING IN PHELAN-MCDERMID SYNDROME

In 2014, we completed a pilot study examining how mutations in SHANK3 impact brain structure and function and contribute to the wide diversity observed in people with autism.

This is the first controlled neuroimaging study of PMS. Diffusion tensor imaging revealed greater abnormalities in the white matter microstructure of individuals with PMS compared to those with idiopathic autism. However, using functional MRI, we found relatively intact brain activity in response to communicative sounds in children with PMS, something that is impaired in ASD more broadly. These findings suggest that despite shared behavioral features, PMS and idiopathic autism may have distinct brain phenotypes and that each group may have unique strengths and challenges.

EFFECTS OF OXYTOCIN TREATMENT ON THE BRAIN IN ASD

Also in 2014, we were awarded a grant from the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development to examine the impact of sustained oxytocin treatment on "social brain" activity in children with ASD. This study is expected to help us understand the therapeutic mechanism of oxytocin and the changes in the brain that predict and accompany response to treatment.

Autism BrainNet

In 2014, the Seaver Autism Center joined Autism BrainNet, a new research initiative bringing together leading research institutions to collaborate on autism brain research. This initiative will facilitate postmortem studies on brain tissue, which is an important way for researchers to gain a deeper understanding of autism on the cellular and molecular levels. This data will contribute to the development of novel treatments for individuals with ASD.

Assessment and Clinical Programs

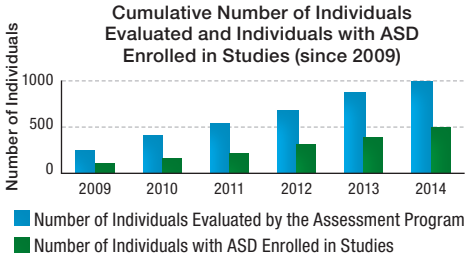
The Assessment and Clinical Programs at the Seaver Autism Center work together to enroll individuals in clinical research studies, while also providing genetic testing, gold-standard diagnostic evaluations, treatment and medication management.

The Assessment Program at the Seaver Autism Center is a centralized clinical evaluation program serving both clinical and clinical research studies at the Center and providing the following: 1) A minimum assessment battery including diagnostic, cognitive, and behavioral measures of core and associated symptoms of ASD; 2) Collection of biological specimens; 3) A standardized database for clinical data shared by Seaver Center researchers, and 4) Training of personnel to research-standards on evaluation tools.

The Assessment Program provides gold-standard diagnostic and psychosocial assessment, as well as the most up-to-date genetic evaluations for all patients participating in our research studies. In 2014, the Assessment Program screened approximately 170 patients. This work is a collaborative effort on the part of doctoral level clinicians and trainees (i.e., residents, graduate students). The Assessment Program serves as a vehicle to screen for genetics, neuroimaging, and treatment studies at the Center. In addition, pilot research by Mount Sinai investigators and collaborators often starts through the screening/evaluation mechanism of this program.

The Clinical Program at the Seaver Autism Center provides the highest level of patient care, supported by research at the cutting edge of the field and informed by the outstanding clinical and basic science research conducted at the Center. The Clinical Program offers comprehensive assessments, psychiatric evaluations, and treatment using both psychosocial and medication interventions. The Clinical Program was very active in 2014, performing approximately 40 separate diagnostic, neuropsychological, or psychiatric evaluations for children, adolescents, and adults.

All faculty members have specialized training in ASD, and all are actively involved in both clinical and research activities at the Seaver Center. The clinical and research programs directly complement each other, creating a synergy benefitting the Center's patient population while accelerating the progression of our understanding of ASD.



Early Diagnosis

The Assessment and Clinical Programs at the Seaver Autism Center are dedicated to early diagnosis of ASD. As part of this effort, Cristina Farrell, MD, has joined the Seaver Center. Dr. Farrell is a developmental pediatrician who is focused on performing evaluations in high-risk populations of children who were born prematurely and required care in the neonatal intensive care unit at Mount Sinai.

Genetic Testing

All families enrolled through the Assessment and Clinical Programs can choose to avail themselves to a genetic evaluation to relate genetic results to other clinical research results. Our assessment clinicians work directly with clinical and molecular geneticists at Mount Sinai to conduct genetic analyses on all consenting families with the goal of identifying the etiological diagnosis. By identifying the cause of autism in an individual, families may be better able to obtain the proper interventions and treatments. This also provides opportunities for genetic counseling, and furthers the goal of identifying new genes in autism and specific treatment targets for future patient-based research endeavors.

In 2015, we are expanding our efforts in genetic testing so all families now receive both chromosomal microarray testing in addition to whole exome sequencing. In addition, a clinical geneticist specializing in autism and early developmental disorders will be joining the clinical research team this year.

COMPREHENSIVE ASSESSMENT AND EVALUATION

Diagnostic tools used by the Seaver Center include:

- Psychiatric evaluations
- Neurological examinations
- Autism Diagnostic Observation Schedule (ADOS)
- Autism Diagnostic Interview-Revised (ADI-R)
- Cognitive testing
- Vineland Adaptive Behavior Scales-II

Genetic, psychological, behavioral, neuropsychological, and educational testing are also available as part of the Clinical Program.

TREATMENT

The Seaver Center continues to offer several treatment services including, but not limited to:

- Individual cognitive behavioral therapy
- Medication management
- Parent training
- Sibling support groups
- School consultations
- Social skills groups

Training Program

The Seaver Autism Center continues to offer a robust Training Program. The training opportunities available span across all programs within the Seaver Center, including genetics, model systems, and clinical research. Seaver trainees work closely with mentors, and they are encouraged to take leadership roles in projects.

Seaver Foundation Fellowships

The Seaver Foundation continues to sponsor research-based fellowships for graduate students, postdoctoral fellows, and junior faculty. In 2014, there were 15 Seaver Fellows across the Center in research areas such as genetic analysis, development of rodent models for ASD, neuroimaging studies, and development and assessment of behavioral and pharmacological interventions. In 2015, a new category of fellowships was introduced for Seaver Clinical Fellows. These awards will support clinical researchers who will work closely with the Clinical Program to be trained in evaluation and treatment of ASD.

Seaver Autism Center/Association for Metroarea Autistic Children Joint Fellowship

The Seaver Center has recently formed a joint fellowship with the Association for Metroarea Autistic Children, Inc. (AMAC). At AMAC, the fellow will perform ASD diagnostic and psychiatric assessments, provide consultation and training to staff and parents, and help design plans for independent living, job coaching, and day habilitation to individuals served by AMAC who are diagnosed with ASD or other disorders. At the Seaver Center, the fellow will be trained in research methods and clinical and neurocognitive assessment techniques. The fellow will also serve as a liaison between the Center and AMAC to coordinate patient referrals between the organizations.

Clinical Research Coordinator Program

The clinical research coordinators continue to play a critical role in supporting and carrying out the mission of the Seaver Center. In addition to administrative and study recruitment responsibilities, clinical research coordinators administer cognitive tests and autism-specific diagnostic tools to patients participating in research studies. Coordinators are encouraged to submit independent research projects to the International Meeting for Autism Research (IMFAR) and are often named as co-authors on papers published in academic journals. As with each previous generation of clinical research coordinators, our coordinators continue to move on to prestigious graduate programs.

Clinical Training Program

The Assessment Program at the Seaver Center provides training to the Center's clinical staff (e.g., psychiatrists, psychology fellows, and graduate students) on evaluation strategies for individuals with ASD. This includes introductory training for child and adolescent psychiatry residents, formalized didactics for psychology trainees, and monthly meetings to maintain reliability on autism diagnostic instruments. In the past year, there were six psychology graduate student trainees and a rotation of medical students, general psychiatry residents, and child psychiatry fellows at the Center. Trainees participate in Autism Diagnostic Interview-Revised (ADI-R) workshops for research reliability, Autism Diagnostic Observation Schedule-Toddler (ADOS-Toddler) research training workshops, and attend didactic sessions from local and nationally known clinicians working in the field of autism research and treatment.

Medical Student Training

Medical students rotating in the Seaver Center receive significant clinical exposure to individuals with ASD and participate actively in research projects. In 2014, Erin Li, a current student, received a Predoctoral Fellowship from the Autism Science Foundation to support her work on phenotyping in Phelan-McDermid syndrome, and Jacquelin Rankine is spending a scholarly year in the Seaver Center in between her third and fourth years of medical school as part of her Master's in Clinical Research track.

Residency Training

Residents training in child and adolescent psychiatry continue to rotate in the Seaver Autism Center and spend time each week observing and learning comprehensive diagnostic evaluations and treatments. Trainees are encouraged to participate in various research protocols, including treatment, neuroimaging, and family/genetic studies in autism.

Psychology Training

The Seaver Center continues to offer training opportunities for advanced psychology doctoral students interested in gaining research and clinical experience with children and adults with ASD. In the past year, the program has expanded didactics to include trainees from Mount Sinai St. Luke's Hospital. This year there will also be a fellow from Mount Sinai St. Luke's rotating through the Seaver Center.

Outreach Program

The Outreach Program is committed to disseminating research findings and educating patients, families and the general public on the causes and treatments of ASD.

Seaver Autism Center Associates Committee

In the past year the Seaver Center, with the help of Alison Singer, Co-Founder and President of the Autism Science Foundation, created the Seaver Autism Center Associates Committee. The group is made up of committed family members and other stakeholders who want to be more actively involved in the work being done at the Seaver Center.

Associates receive annual updates from researchers, special access to scientists and presentations, and invitations to exclusive events including intimate lectures by Seaver researchers. The committee will also help define the direction of the Center, drive the Center's mission forward, and contribute to the strategic plan by helping to support philanthropic efforts. The first Associates Committee event, a panel discussion called "Unlocking the Mystery of Autism: From Genes to Novel Treatments," was held in 2014, and additional events are taking place this year.

L-R: ALISON SINGER, MBA; JOSEPH BUXBAUM, PHD; ALEXANDER KOLEVZON, MD, AND MICHELLE GORENSTEIN-HOLTZMAN, PSYD, AT THE PANEL DISCUSSION IN 2014.

Museum Tour Program

The Seaver Autism Center developed a relationship with the American Museum of Natural History to help the museum become better equipped to offer tours for individuals with ASD and their families. Michelle Gorenstein-Holtzman, PsyD, Director of Community Outreach, and Danielle Halpern, PsyD, Director of Psychology Training, led trainings to teach museum tour guides and volunteers about ASD, and provide ideas for interventions to use when conducting these tours. Drs. Gorenstein-Holtzman and Halpern also helped develop a monthly autism tour for children on the autism spectrum called the Discover Squad. Due to the high demand for this specialized tour, Drs. Gorenstein-Holtzman and Halpern developed materials (i.e., social stories, visual cues, prompt cards) for a second tour, and materials for a third tour have been requested.

To book a tour, visit *http://www.amnh.org/plan-your-visit/accessibility/autism-spectrum*.

The Curious Incident of the Dog in the Night-Time

In November 2014, Dr. Gorenstein-Holtzman was asked to attend a performance of *The Curious Incident of the Dog in the Night-Time* at the Ethel Barrymore Theater in New York City to provide feedback as to what modifications would be necessary for the first-ever autism-friendly performance of a play. Invited by Benjamin Klein, Associate Director, and Lorin Latarro, Associate Choreographer, Dr. Gorenstein-Holtzman attended a showing and provided feedback on modifications for sound effects and lighting. As part of the Autism Theater Initiative sponsored by the Theater Development Fund, which makes theater accessible to individuals with ASD and their families, individuals who purchased tickets to the performances were able to download a social story. In addition, there were quiet areas and sensory activities set up throughout the theater for individuals who needed breaks. The performance was made possible in part by Autism Speaks.

Community Outreach Events

Annual Conference

34%
Increase in the Number of Attendees

Our Annual Advances in Autism Conference brings together academic, parent, and community groups to participate in thoughtful and informative presentations. The goals of the conference are to teach participants about recent advances in understanding the causes of autism, brain development in people with autism, and current treatments of autism. This past year's conference was held on November 16, 2014 and featured John Elder Robison, *New York Times* bestselling author of *Look Me in the Eye* and *Raising Cubby*, as the Keynote Speaker. The conference also included three scientific presentations by Joseph Buxbaum, PhD, Alexander Kolevzon, MD, and Bob Schultz, PhD (Children's Hospital of Philadelphia).

The 19th Annual Advances in Autism Conference will be held on Sunday, October 25, 2015. For more information, visit www.seaverautismcenter.org or email annualconference@seaverautismcenter.org.

18TH ANNUAL ADVANCES IN AUTISM CONFERENCE 2014 SPEAKERS (L-R): BOB SCHULTZ, PHD; JOHN ELDER ROBISON; JOSEPH D. BUXBAUM, PHD; JAMIE ROITMAN; HIRSCHELL E. LEVINE, ESQ.; AND ALEXANDER KOLEVZON, MD

Distinguished Lecturer Series

We continue to host speakers as part of our Distinguished Lecturer Series. In 2014 we had three such lecturers:

- Christina Hultman, PhD, "Swedish national samples in psychiatric epidemiology and psychiatric genetics"
- Bernie Devlin, PhD, "Genetics opens a window to view risk for autism"
- Kathryn Roeder, PhD, "Network assisted analysis helps reveal the genetic basis of autism"

Seaver Seminar Series

The Seaver Seminar Series continues to be a central component of the education efforts at the Seaver Center. Speakers throughout 2014 included:

- Xin He, PhD, "Integrated model of multiple types of rare variants and prior information improves the power of detecting risk genes for autism"
- Lia Abbasi Moheb, PhD, "Identification of three novel genes for autosomal recessive intellectual disability and molecular characterization of the causative defects"
- James McPartland, PhD, "Social motivation in autism"
- Evdokia Anagnostou, MD, "From lesion to treatment: The promise of translation in experimental therapeutics in autism"
- Bhismadev Chakrabarti, PhD, "The link between reward and empathy: Clues from and for autism"
- Conny van Ravenswaaij-Arts, MD, PhD, "The introduction of new genetic techniques in the diagnostics of developmental delay"
- Naoki Higashida (Special Seminar), "Becoming the Wind: Scenes from my Autistic Life"
- Emanuel DiCicco-Bloom, MD, "Modeling neuropsychiatric disorders: Altering hindbrain gene function disrupts forebrain growth, neurogenesis and behaviors through monoamine systems"

Community Lecture Series

The Seaver Center continues to expand the community lecture series to disseminate research findings to local groups. Presentations have included parent and school meetings held at the Jewish Community Center in Manhattan (JCC-Manhattan), the United Jewish Appeal – Federation of Jewish Philanthropies of New York, Inc. (UJA Federation), Manhattan Autism Charter School, YAI/National Institute for People with Disabilities (YAI/NIPD), NYC Administration for Children's Services, and Sinergia. We also continue to provide parent lectures to UJA-funded community centers as needed.

Communications

The Seaver Autism Center has a robust communications program that seeks to promote the clinical, research, and community-based programs that are central to our core mission. These efforts include the quarterly newsletter, press releases, informational booklets and brochures, websites, and social media. These initiatives seek to ensure professionals, parents, and advocates for people with ASD are aware of the important research we conduct, the engaging and valuable programs we offer, and the support we provide to an ever-expanding number of families.

Molecular Autism

In July 2014, Thomson Reuters awarded an Impact Factor (IF) of 5.486 to the open access journal *Molecular Autism*, co-edited by Dr. Buxbaum. This represents the highest IF for any journal dedicated to autism or related neurodevelopmental conditions.

Molecular Autism
Brain, Cognition and Behavior
IMPACT FACTOR 5.49

This IF is the first for *Molecular Autism* after being tracked for several years, and it places the journal among the highest in the broader fields of neurosciences and genetics based on category information from the 2013 Journal Citation Report. It ranks 34 out of 251 journals in Neuroscience, and 21 out of 164 journals in Genetics & Heredity.

Dr. Buxbaum created the journal in 2010 with Simon Baron-Cohen, PhD, Director of the Autism Research Centre at the University of Cambridge. The goal of the journal is to provide an outlet for high profile autism research papers, and to make this cutting-edge research available freely via open access.

Newsletter

The Seaver Autism Center Newsletter provides updates about new developments related to research and treatment of ASD, as well as events and activities at the Seaver Center. Started in 2010, the Seaver Center Newsletter continues to be published on a quarterly basis.

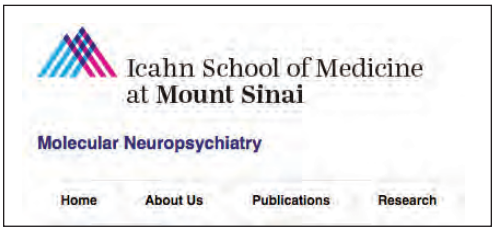
Web

SEAVER AUTISM CENTER WEBSITE

The Seaver Autism Center website (www.seaverautismcenter.org) continues to include descriptions of preclinical and clinical research, clinical services, resources, publications, and frequently asked questions and answers related to autism.

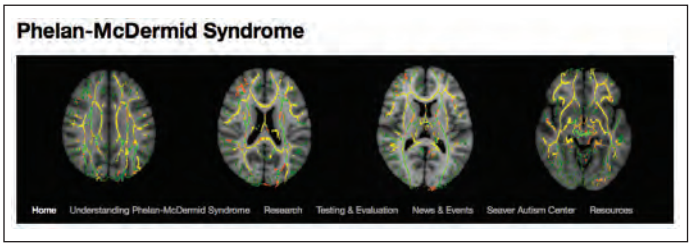
LABORATORY OF MOLECULAR NEUROPSYCHIATRY WEBSITE

Our new and improved website for the Laboratory of Molecular Neuropsychiatry (http://labs.icahn.mssm.edu/buxbaum-lab) includes detailed information about the research conducted by the laboratory, which is led by Joseph Buxbaum, PhD, as well as biographies and research interests of all lab members.



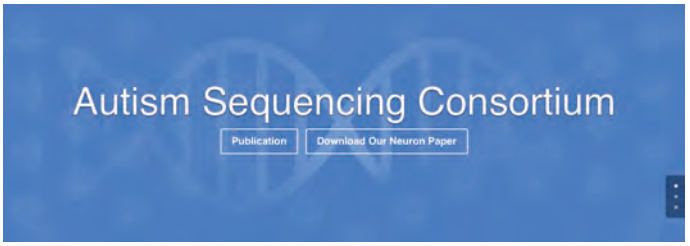
SHANK3 AND PHELAN-MCDERMID SYNDROME WEBSITE

We have revamped the website dedicated to our focus on the SHANK3 gene and Phelan-McDermid syndrome (www.shank3gene.org). This website now includes up-to-date research findings from our group and other researchers in the field, event announcements, and resources for families affected by Phelan-McDermid syndrome.



AUTISM SEQUENCING CONSORTIUM WEBSITE

We have also recently launched a website for the Autism Sequencing Consortium, in collaboration with Emory University (www.autismsequencingconsortium.org).



Social Media

In order to further disseminate activities happening at the Seaver Center and further engage with our audience of professionals, parents, and advocates, in 2014 we focused on developing the Seaver Center's social media presence. We use these pages to share the latest research updates, media activity, and event announcements.

Like us on Facebook.
www.facebook.com/SeaverAutismCenter

Follow us on Twitter.
www.twitter.com/SeaverAutism.

To learn more about current research and new developments, visit us online at www.seaverautismcenter.org.

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Mount Sinai

Seaver Autism Center for Research and Treatment

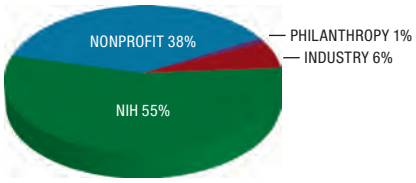
Mount Sinai

Seaver Autism Center for Research and Treatment

Our research is directed by the need to provide better care and service for families affected by ASD. Our commitment to research is driven by our compassion and dedication to patient care, as well as to advance the field of autism research. The Seaver Autism Center is a major player in this field at every stage, from laboratory and clinical research, to training and outreach in the community. Because of this, the Center is at the forefront of translating research findings into improved community care. Moving forward, we will continue to identify the causes of autism and advance effective treatments in order to reduce disability and improve the lives of families affected by ASD.

The Seaver Autism Center is funded in large part by the Beatrice and Samuel A. Seaver Foundation and the National Institutes of Health. The Center also receives support from philanthropy, the pharmaceutical industry, and nonprofit organizations including the Autism Science Foundation, Simons Foundation, and Autism Speaks.

Seaver Autism Center Revenue 2014



If you would like to learn more or contribute to research being conducted at the Seaver Autism Center, please visit us online at www.seaverautismcenter.org.

seaver autism center for research & treatment @ mount sinai

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