

2023–2027 NIDCD Strategic Plan



**Advancing the Science of
Communication to Improve Lives**



National Institute on
Deafness and Other
Communication Disorders

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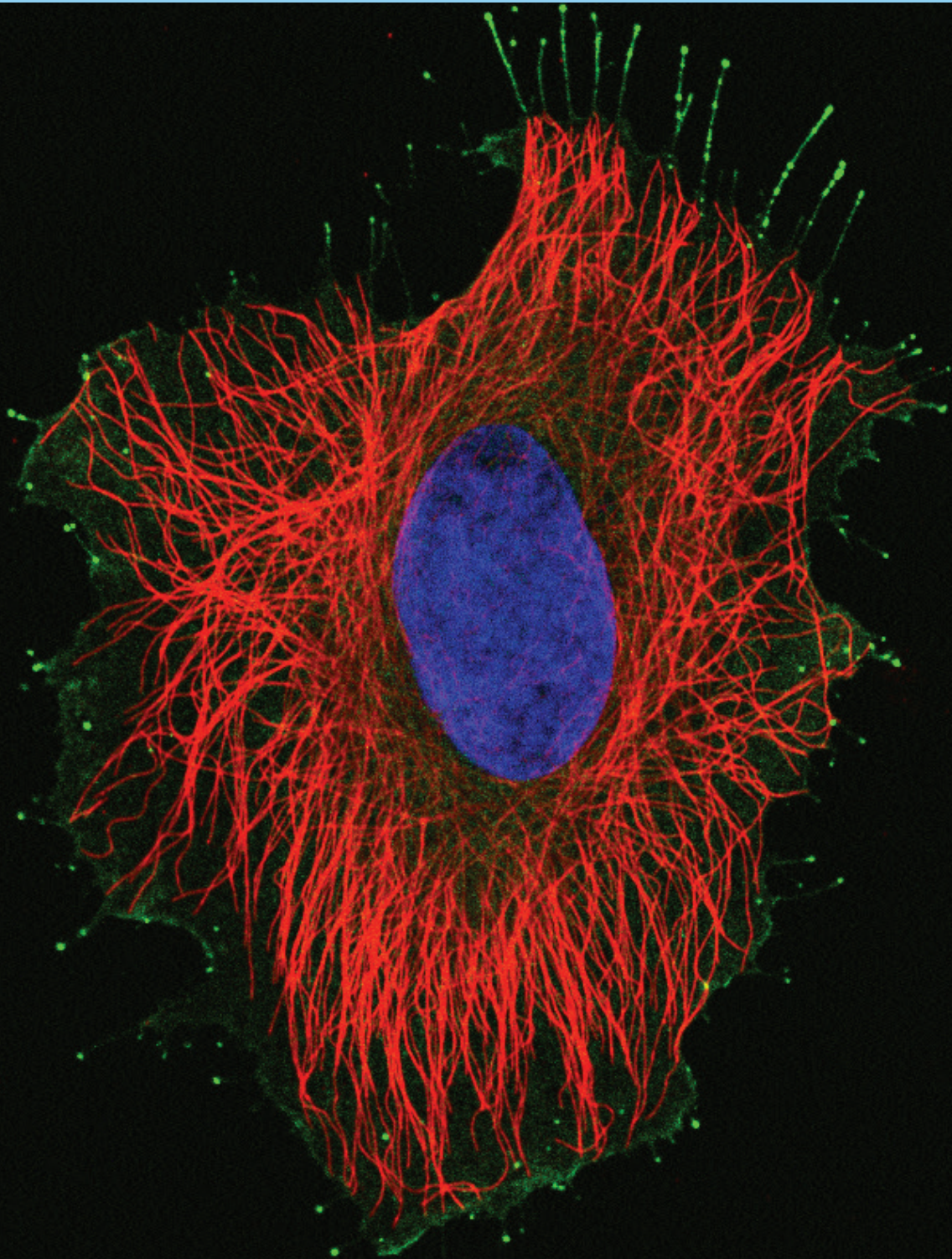
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Deafness protein, Myosin 15, accumulates at tips of finger-like filopodia. Microtubules (red) and actin filaments provide structural support for this human HeLa cell (nucleus in blue). Molecular motors like Myosin 15 (green), a protein essential for normal hearing in people, use actin filaments as railroad tracks to transport cargo within the cell.

Credit: Melanie Barzik, Ph.D., NIDCD

Director's Message

I'm pleased to share the 2023–2027 National Institute on Deafness and Other Communication Disorders (NIDCD) Strategic Plan: Advancing the Science of Communication to Improve Lives. NIDCD's mission is to improve the lives of the millions of people with hearing loss and communication disorders, spanning functions of hearing, balance, taste, smell, voice, speech, and language. This plan contains ambitious, achievable goals for the science in our mission areas—goals that will further our scientific understanding of basic biological systems, human disease mechanisms, and promising treatments.

Thank you to everyone who submitted comments on the draft themes and goals for this new plan. I appreciate the valuable input provided to us as we developed and finalized a plan to guide us for the next five years.

Over the past 34 years, researchers supported by NIDCD have made seminal advances leading to increasingly effective, evidence-based treatments for diseases and disorders that affect an ever-growing segment of the population. These remarkable advances in science, technology, and computing create unprecedented opportunities for knowledge discovery, clinical translation, and public health. NIDCD's vision statement reflects our hope to leverage these opportunities: Advancing the science of communication to improve lives.

Our 2023–2027 Strategic Plan was developed through a collaboration between NIDCD staff, the scientific community, members of the public, advocacy groups, and professional organizations. NIDCD began development of the plan by examining both our currently funded research project portfolio and available assessments of public health need and disease burden in our mission areas. We then solicited input from the scientific community, requesting bold ideas that would lead to breakthrough advances in our scientific mission areas. These ideas were further explored both in virtual meetings with members of the scientific community and by NIDCD scientific staff, leading to the six major themes and accompanying



Debara L. Tucci, M.D., M.S., M.B.A.
Director, NIDCD

aspirational goals of the plan. Additional input was obtained from our public constituencies during the public comment period. These comments were carefully considered, and changes to the plan were made where appropriate. The process of refining the plan depended upon the thoughtful input of NIDCD's collaborators and helped us to identify areas of unmet research needs and opportunity, including public health challenges that fall within our mission and vision. NIDCD will use this plan to guide our research investments. Our goal is to support innovative, crosscutting, multidisciplinary research so that all Americans can benefit from scientific discovery that will inform effective and accessible prevention strategies and treatments for deafness and communication disorders.

Thank you for your interest in NIDCD's scientific research. For more information, please visit the NIDCD website at <https://www.nidcd.nih.gov>.

Sincerely,

Debara L. Tucci, M.D., M.S., M.B.A.
 Director
 National Institute on Deafness and Other
 Communication Disorders

NIDCD Mission

The NIDCD mission is to conduct and support research and research training in the normal and disordered processes of hearing, balance, taste, smell, voice, speech, and language.



Hearing



Balance

NIDCD Vision

Advancing the science of communication to improve lives.



Taste and Smell



Voice, Speech, and Language



NIDCD Overview

NIDCD conducts and supports research and research training related to disease prevention and health promotion; addresses special biomedical and behavioral problems experienced by people who have communication impairments or disorders; supports research evaluating approaches to the identification and treatment of communication disorders and patient outcomes; and supports efforts to create devices that substitute for lost and impaired sensory and communication function.

NIDCD accomplishes its research mission through three divisions: the Division of Intramural Research (DIR), the Division of Scientific Programs (DSP), and the Division of Extramural Activities (DEA). DIR conducts research and related support activities in laboratories and clinics housed at National Institutes of Health (NIH). DSP and DEA manage complementary aspects of NIDCD's Extramural Research Program, a program of research grants, career development awards, individual and institutional research training awards, center grants, and contracts to public and private research institutions and organizations throughout the United States and abroad.

NIDCD manages a broad range of projects in both basic and clinical research. NIDCD research is organized into three program areas: hearing and balance; taste and smell; and voice, speech, and language. The three program areas seek to answer fundamental scientific questions about normal function and disorders and to identify patient-oriented scientific discoveries for preventing, screening, diagnosing, and treating disorders of human communication.



Hearing and Balance Program

The NIDCD Hearing Program (<https://www.nidcd.nih.gov/research/extramural/hearing-program>) and Balance Program (<https://www.nidcd.nih.gov/research/extramural/balance-program>) encompass over half of NIDCD's research portfolio. To study normal and disordered functions of the auditory and vestibular systems, NIDCD employs a wide range of research approaches such as molecular genetics, cellular biology, animal models, biomedical imaging, nanotechnology, psychoacoustics, and structural and functional biology. NIDCD supports research that will lead to improved treatments for, and prevention of, hearing and balance disorders.



A newborn undergoes a hearing screening.

IMAGINE THE FUTURE...

People with vestibular nerve tumors get effective treatments that spare hearing, balance, and facial nerve function without surgery.

Taste and Smell Program

The NIDCD Taste and Smell Program (<https://www.nidcd.nih.gov/research/extramural/taste-and-smell-program>) supports studies of the chemical senses known as taste, smell, and chemesthesis (chemically provoked irritation) to enhance our understanding of how individuals gather information about their environment and how human chemosensory disorders can be diagnosed and treated. NIDCD-supported research on molecular and cellular biology, animal models, biophysics, and biochemistry of the olfactory and gustatory systems is paving the way for improved diagnosis, prevention, and treatment of chemosensory disorders.

Voice, Speech, and Language Program

The NIDCD Voice, Speech, and Language Program (<https://www.nidcd.nih.gov/research/extramural/voice-speech-language-program>) uses a wide range of research approaches to develop effective diagnostic and intervention strategies for people with communication impairments. Research in voice and speech determines the nature, causes, treatment, and prevention of disorders of motor speech production throughout the lifespan. Language research includes the exploration of the genetic bases of child speech and language disorders, as well as characterizing the linguistic and cognitive deficits in children and adults with language disorders.

IMAGINE THE FUTURE...

Health care providers use brain imaging to help identify which children will develop persistent speech delay or stuttering and begin transformative therapy early.

NIDCD Statutory Authority

42 U.S.C. § 285m: The general purpose of the National Institute on Deafness and Other Communication Disorders (hereafter referred to in this subpart as the “Institute”) is the conduct and support of research and training, the dissemination of health information, and other programs with respect to disorders of hearing and other communication processes, including diseases affecting hearing, balance, voice, speech, language, taste, and smell.

Establishment

President Ronald Reagan signed P.L. 100-553 into law on October 28, 1988, establishing NIDCD as a new institute within NIH.

Until that time, research on communication sciences had been supported by NIH through the National Institute of Neurological and Communicative Disorders and Stroke (now the National Institute of Neurological Disorders and Stroke). Individuals with hearing loss, researchers, clinicians, and professional societies worked together to advocate to Congress to



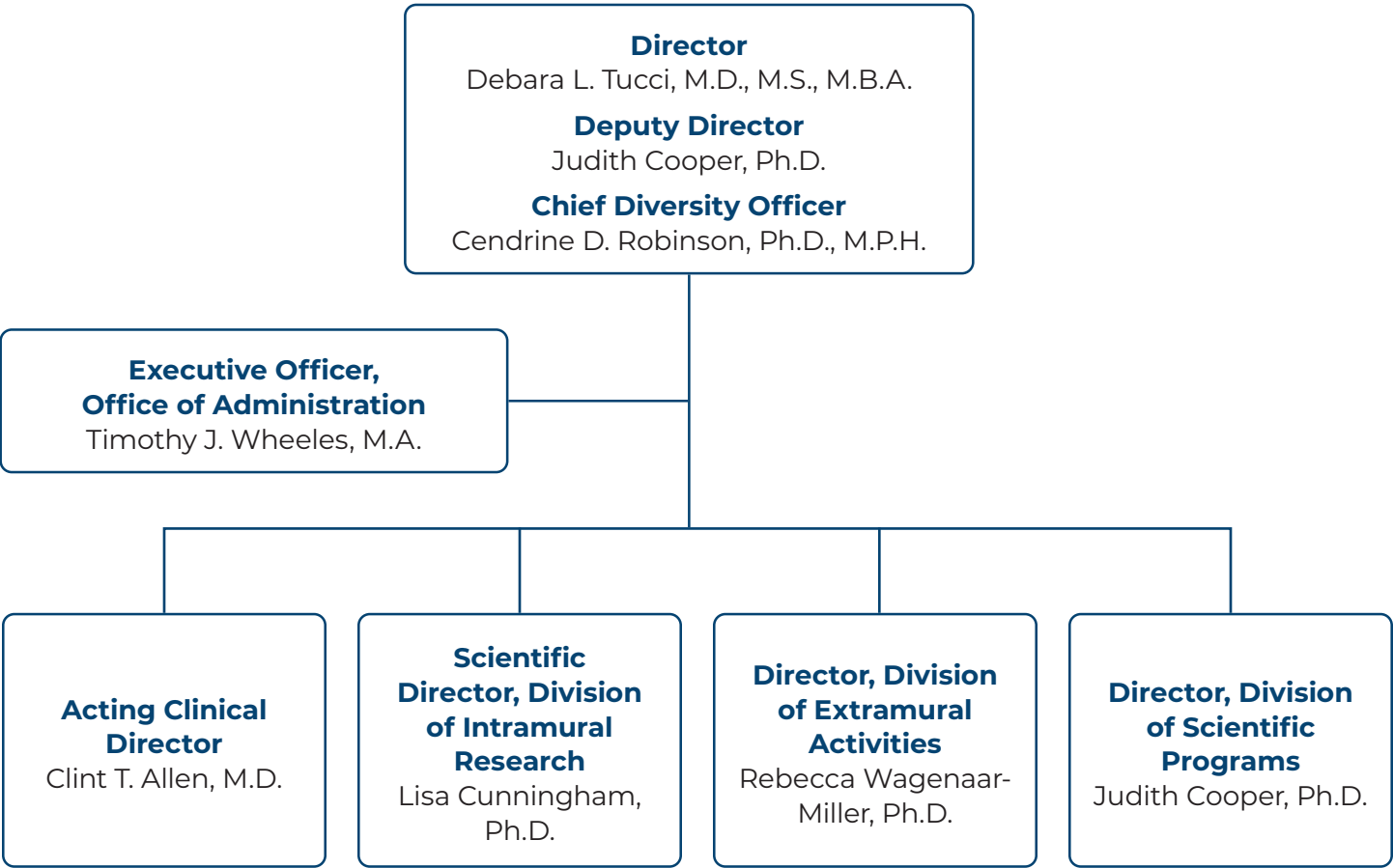
Former NFL player Larry Brown (left), patient advocate Geraldine Dietz Fox, and Congressman Claude Pepper discuss the importance of hearing research.

authorize a new institute at NIH. Representative Claude Pepper (D-FL) and Senator Tom Harkin (D-IA) introduced the National Deafness and Other Communications Disorders Act of 1988 (S. 1727), which quickly passed in Congress and was signed into law, establishing a new NIH institute dedicated to research and research training in hearing, balance, taste, smell, voice, speech, and language.

Other Statutory Authority

Another provision in the Public Health Services Act (42 U.S.C. § 280g-1) directs the NIH Director, acting through the NIDCD Director, to continue a program of research and development on the efficacy of new screening techniques and technology, including clinical studies of screening methods, studies on efficacy of intervention, and related research for early detection, diagnosis, and treatment for newborns, infants, and young children who are deaf or hard-of-hearing.

NIDCD Organizational Chart





Serving as an Efficient and Effective Steward of Public Resources



Setting Priorities

The first step in prioritization is to identify the most promising research. NIDCD sets research priorities by identifying areas of scientific opportunity that will address the greatest public health needs. NIDCD encourages investigator-initiated applications in basic, translational, and clinical research that help achieve the NIDCD mission. In particular, the Institute encourages investigators to submit applications for research projects that directly address themes and strategic goals within NIDCD's strategic plan. NIDCD will, however, remain flexible to respond to emerging scientific or clinical challenges and new opportunities.

NIDCD uses the NIH system of peer review to evaluate meritorious research grant applications. A panel of scientific experts from outside of NIH, with both broad and specialized expertise, review the applications for overall scientific and technical merit. To learn more about the NIH peer review process, see <https://grants.nih.gov/grants/peer-review.htm>.

NIDCD promotes the plan to the research community to increase awareness of Institute priorities. The plan creates a unified vision for the future with researchers, the public, and policymakers. To develop the 2023–2027 Strategic Plan, NIDCD solicited input from scientific experts, the National Deafness and Other Communication Disorders (NIDCD) Advisory Council, NIDCD staff, and the public. See [Appendix A](#) for more details on the strategic planning process.

Excel as a Federal Science Agency by Managing for Results

NIDCD is a public science agency supported by federal funds. As part of NIH, NIDCD is obligated to base its funding decisions on the strength of the proposed science and to make its decision-making process transparent. NIDCD upholds its accountability to the American public by managing its scientific endeavors to achieve results that improve the lives of individuals who are deaf, hard-of-hearing, or presenting with communication disorders. The accountability process includes reporting, as required by the Government Performance and Results Act (GPRA); an administrative strategic plan that ensures effective, responsive management and operations; and agile plans to mitigate the risks involved in fulfilling the NIDCD mission.

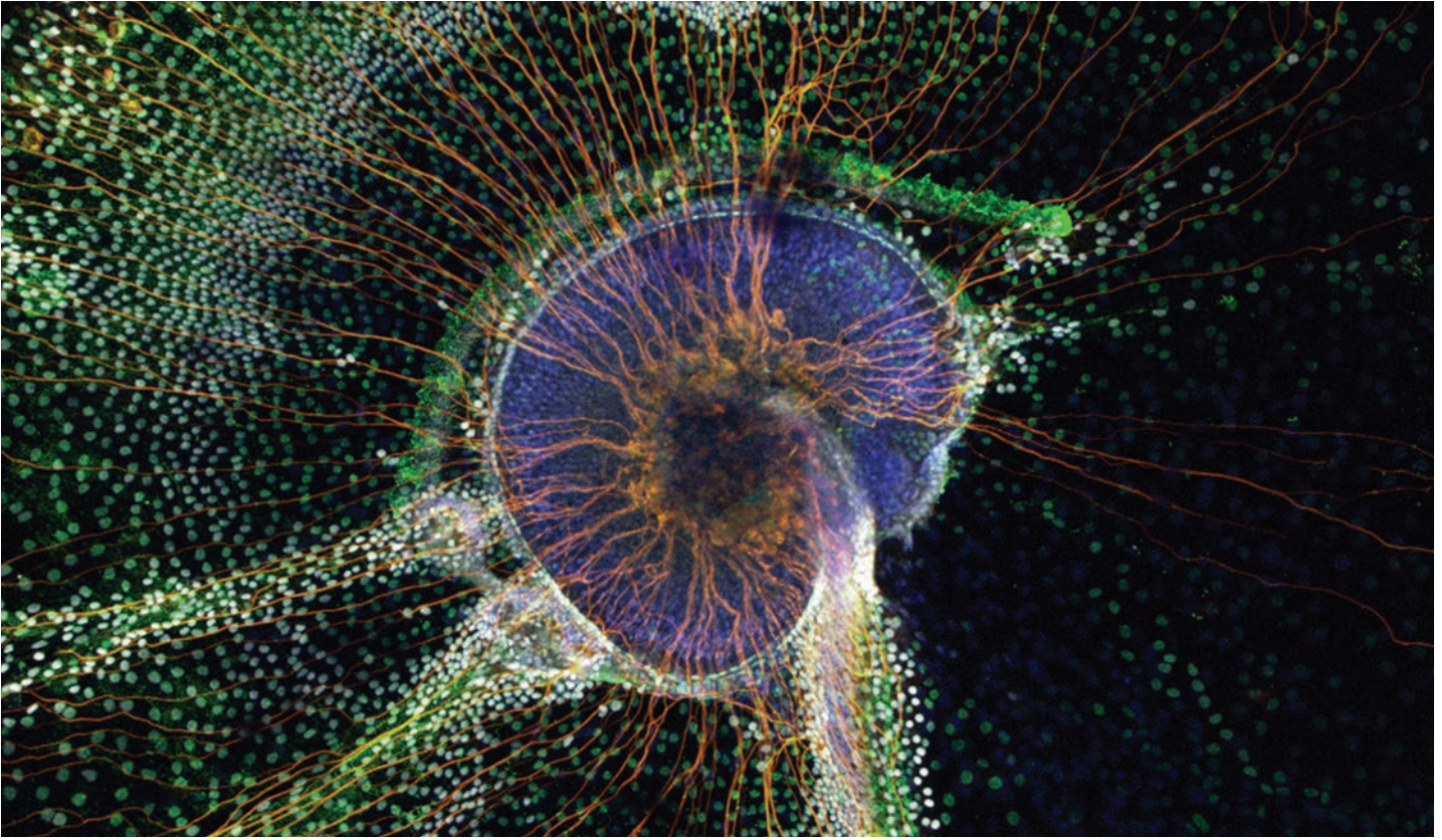
GPRA (https://dpcpsi.nih.gov/oepr/performance_reporting), a public law passed by Congress in 1993 (Public Law 103-62) to improve stewardship in the Federal Government, links resources and management decisions with program performance. To comply with GPRA, NIH develops an annual plan proposing goals that provide a representative sample of NIH’s activities for each year; describes how these goals will be met; and provides evidence to support any claims for successful achievement of the goals. Each Institute and Center at NIH participates in the GPRA reporting process, including NIDCD.

Internally, NIDCD also effectively manages its public funds for results by developing and using an NIDCD Administrative Strategic Plan. Every three years, NIDCD staff identify administrative challenges at the Institute and develop an NIDCD Administrative Strategic Plan to address these challenges. The Administrative Strategic Plan helps NIDCD manage its administrative services in support of the NIDCD’s mission by:

- Modeling innovative management approaches and sharing best practices within and between NIDCD offices
- Improving employee quality of life and job satisfaction by implementing clear, consistent administrative service practices
- Providing better decision-making and transparency by setting and tracking goals

Annually, NIDCD conducts a risk inventory assessment to support the NIH Director’s Financial Integrity Act attestation and develops a risk management plan to ensure that public funds are invested and administered in compliance with applicable laws, regulations, and policies.

The plan examines NIDCD’s activities and assesses risks, establishes methods for control of those risks, monitors adherence to the risk-reduction methods, and mitigates risks involved in administering the NIDCD mission. NIDCD’s assessment tries to minimize the risk of failure in all NIDCD activities, and it is submitted each year as part of the overall NIH Risk Management Program (<https://policymanual.nih.gov/1750>).



A mouse cochlea (purple) grown in cell culture, and neurons (orange) that send information from the cochlea to the brain. The cochlea is the hearing organ of the inner ear. Researchers are using these miniature structures to learn how individual cell types work and to test potential therapies for hearing loss.

Credit: Taha A. Jan, M.D., and Mirko Scheibinger, Ph.D., Woods Hole Marine Biological Laboratory.

NIH-Wide Crosscutting Priorities







Many scientific challenges and opportunities are not unique to any one theme in this plan. To emphasize this, NIDCD has identified six key crosscutting priorities that span all aspects of NIDCD's mission. These priorities are:

- Seek innovation through partnerships
- Strengthen research training and career development
- Reinforce a culture of scientific workforce diversity, equity, inclusion, and accessibility (DEIA)
- Participate in international research to improve global health
- Advance research to improve women's health
- Reduce health disparities

2023–2027 NIDCD STRATEGIC PLAN

Advancing the science of communication to improve lives

Future Directions in NIDCD Research

THEME 1	THEME 2	THEME 3	THEME 4	THEME 5	THEME 6
 <p>Capitalize on advances in basic research to enhance our understanding of normal function and disordered processes</p>	 <p>Develop and improve model systems to inform research</p>	 <p>Promote a precision medicine approach to prevention, diagnosis, and treatment</p>	 <p>Translate and implement scientific advances into standard clinical care</p>	 <p>Facilitate use of and best practices in biomedical data science</p>	 <p>Harness advanced technology to improve prevention, diagnosis, and treatment</p>

NIH-Wide Crosscutting Priorities



Seek innovation through partnerships



Strengthen research training and career development



Reinforce a culture of scientific workforce diversity, equity, inclusion, and accessibility



Participate in international research to improve global health



Advance research to improve women's health



Reduce health disparities

Seek Innovation through Partnerships

NIDCD continues to partner with other NIH Institutes and Centers in related research areas to leverage what they learn to advance our own mission. Examples include the BRAIN Initiative® (<https://braininitiative.nih.gov>), All of Us Research Program (<https://allofus.nih.gov>), and NIH-wide initiatives in the areas of Alzheimer’s disease and related dementias, and Down syndrome (<https://www.nih.gov/include-project/about-down-syndrome>). These partnerships improve our understanding of communication disorders and encourage innovation. Read more about NIH-wide and trans-agency efforts in the “Leveraging Partnerships” section of the NIH-Wide Strategic Plan (<https://www.nih.gov/sites/default/files/about-nih/strategic-plan-fy2021-2025-508.pdf>).

Strengthen Research Training and Career Development

NIDCD recognizes the importance of research training and career development opportunities (<https://www.nidcd.nih.gov/training>) to ensure a productive, diverse, creative, and innovative cadre of qualified scientists in basic, clinical, and translational research in the Institute’s mission areas. NIDCD is continuously adapting its research training and career development efforts to help new scientists establish careers in our mission areas, encourage clinicians to pursue opportunities in translational research, and use shared research resources.

The field of human communication sciences greatly benefits from interdisciplinary research teams to bridge the gap between laboratory research and patient care. Such teams provide clinicians with a deeper understanding of the latest research discoveries, facilitating the introduction of new diagnostic and treatment approaches into the clinic. Likewise, these collaborations provide basic researchers with a more thorough understanding of patients’ needs, challenges, and opportunities. The creation of such interdisciplinary teams—in which scientists with varied perspectives are cross-trained by one another—could spark new ways to better prevent, detect, and treat communication and chemosensory disorders by identifying new directions for scientific discovery, conducting hypothesis-driven clinical trials, assessing new diagnostic tools and interventions, and improving public health and well-being.

Reinforce a Culture of Scientific Workforce Diversity, Equity, Inclusion, and Accessibility (DEIA)



Research studies indicate that diverse teams working together and capitalizing on innovative ideas and distinct perspectives outperform homogeneous teams. NIDCD recognizes the critical need to address barriers that interfere with the scientific aspirations of individuals from diverse backgrounds (<https://diversity.nih.gov/about-us/population-underrepresented>), including women and minorities, individuals with disabilities, and individuals from rural areas and other underserved populations. NIDCD is working to increase the number of individuals from diverse backgrounds in the research pipeline in our scientific mission areas, for both the extramural and intramural programs (<https://www.nidcd.nih.gov/research/building-diverse-scientific-workforce>).

IMAGINE THE FUTURE...

Regardless of background, people of all ages who want to engage in and contribute to science will have access to education, training, and career opportunities.

NIDCD's ongoing extramural DEIA efforts include:

- Funding opportunities to diversify our training and mentoring pipelines (<https://grants.nih.gov/grants/guide/pa-files/PAR-21-186.html>)
- Funding opportunities to promote workforce diversity among new investigators (<https://grants.nih.gov/grants/guide/rfa-files/RFA-DC-23-001.html>)
- Detailed guidance on applying for a grant or for research training or career development funding:
 - ▶ How to Apply for a Grant, Research Training, or Career Development Funding (<https://www.nidcd.nih.gov/funding/apply>)
 - ▶ Examples of successful grant applications to guide prospective grantees (<https://www.nidcd.nih.gov/funding/sample-grant-applications>)
- A webpage describing extramural research workforce diversity programs, including the NIDCD Diversity Scholars Program (<https://www.nidcd.nih.gov/research/building-diverse-scientific-workforce>)
- Broadening distribution of an e-newsletter, which highlights funding opportunity announcements, upcoming webinars, updates from the NIDCD Advisory Council, and other NIH resources, to recent grant applicants, as well as applicants located at Historically Black Colleges and Universities (HBCUs) and Minority-Serving Institutions (MSIs)
- Increased NIDCD participation at conferences that reach a broader audience of professionals and trainees to share information about application processes and funding opportunities

NIDCD's ongoing intramural DEIA efforts include:

- Development and use of an NIDCD Intramural Recruitment Guide for all recruitments in the Institute
- NIDCD internal recruiting committee identification of a diverse list of highly qualified applicants to the NIH Postbaccalaureate Program (https://www.training.nih.gov/programs/postbac_irta) for consideration by NIDCD Intramural Investigators

NIDCD created the position of Chief Diversity Officer and, in 2022, hired the first person to serve in this role (<https://www.nidcd.nih.gov/news/2022/cendrine-d-robinson-selected-nidcds-first-chief-diversity-officer>). This member of the NIDCD leadership team will help direct our efforts to develop and retain a diverse extramural and intramural workforce, engage more effectively with underrepresented populations in clinical research in our mission areas, and ensure that the NIDCD workplace is diverse, respectful, and inclusive. NIDCD recognizes that our ability to remain global leaders in scientific discovery and innovation depends upon a pool of highly talented scientists from diverse backgrounds.

Participate in International Research to Improve Global Health

NIDCD aims to reduce the burden of hearing loss and communication disorders in the United States and around the globe. The Institute supports and facilitates global health research at both domestic and foreign institutions. NIDCD efforts include support of collaborations between U.S. and international researchers at institutions worldwide, expanding the scientific workforce, and improving access to the world’s collective scientific talent and expertise. NIDCD also aims to train the next generation of scientists to address global health concerns in deafness and communication disorders.

IMAGINE THE FUTURE...

Children with hearing loss, anywhere in the world, can access the most effective treatment options—including biologic therapy or advanced technologies—to reach their full potential.

By supporting international research, NIDCD can accelerate the discovery of causes and interventions for deafness and communication disorders. For example, NIDCD-supported international collaborations based in the NIDCD intramural program facilitated the collection of genetic data from families around the world who are affected by deafness and stuttering. This research uncovered gene variations associated with these conditions and provided additional insights into their causes and potential targeted treatments.

Learn more about current international initiatives that are related to NIDCD’s mission:

<https://www.nidcd.nih.gov/research/global-health>.



Advance Research to Improve Women’s Health

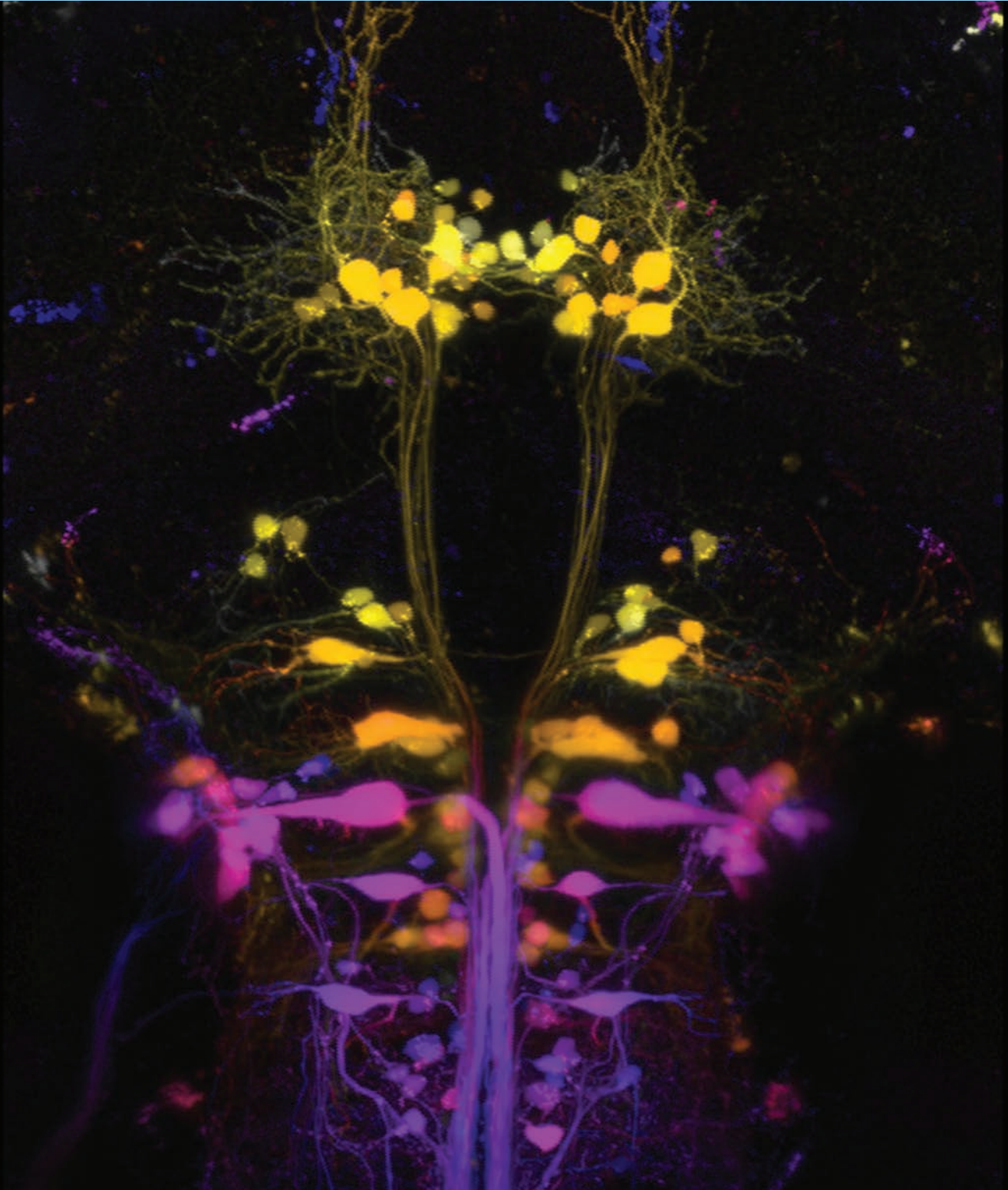
Recognizing the importance of both advancing research related to women’s health and encouraging women to pursue biomedical research careers, NIDCD is working to promote women’s health research, expand the understanding of sex differences, cultivate and retain women in biomedical careers, and ensure the inclusion of women in research. NIDCD reports our efforts to include women in health research and clinical trials in our biennial update to help evaluate progress on the goals described in the Trans-NIH Strategic Plan for Women’s Health Research (<https://orwh.od.nih.gov/about/trans-nih-strategic-plan-womens-health-research>).

Reduce Health Disparities

NIDCD recognizes that medical advances and technology improvements have not improved the health of all Americans equally. Health disparities, reflected in disparate access to quality health care interventions, have a disproportionately high impact on racial and ethnic minority populations, individuals of less privileged socioeconomic status, underserved rural residents, and sexual and gender minorities. NIDCD participates in and stands behind the NIH Minority Health and Health Disparities (MHHD) Strategic Plan 2021–2025 (<https://www.nimhd.nih.gov/about/strategic-plan/nih-strategic-plan-directors-foreword.html>). NIDCD is taking action to achieve the MHHD Strategic Plan goal to advance the scientific understanding of health disparities. For example, NIDCD aims to define the rates of hearing impairment by race and ethnicity by 2030. NIDCD’s research opportunities to promote diversity (described above) also support the MHHD Strategic Plan goals aimed at broadening the cadre of individuals trained to conduct health disparities research.

IMAGINE THE FUTURE...

Clinicians utilize research data on sex and gender to improve diagnosis and treatment of communication disorders.



Labelled neurons in the brainstem of a zebrafish that project to the spinal cord. The image is color-coded such that the neurons deepest in the brain are yellow, and those closest to the top are purple. Together they enable the fish to maintain posture and to navigate through the water.

Credit: Basak Sevinc, M.S. and David Schoppik, Ph.D., NYU School of Medicine.

Future Directions in NIDCD Scientific Program Areas

NIDCD looks to the scientific community to identify the most promising research and will continue to support investigator-initiated projects. Our collaborators identified the themes and goals during our strategic planning process ([see Appendix A](#)) as areas of opportunity for the Institute. Accordingly, these areas are of high priority for the Institute over the next five years. Within the themes and goals outlined below, we use the terms “communication” and “sensory” in relation to all of NIDCD’s seven mission areas: hearing, balance, taste, smell, voice, speech, and language.

Theme 1: Capitalize on advances in basic research to enhance our understanding of normal function and disordered processes.

Basic research is foundational for all NIDCD mission areas, and scientific progress requires interdisciplinary approaches to develop new technologies, improve methods of data analysis, and provide insight on fundamental disease pathways. NIDCD seeks to leverage new technologies and recent discoveries to better understand normal and disordered function of cells, circuits, tissues, whole organs, and systems; and individual or social group behaviors that play important roles in human communication. By defining what is normal in both humans and animal models, we can better understand mechanisms of disease. Increasing our knowledge of the mechanisms of diseases, disorders, and dysfunctions that impair human communication and health can lead to fundamental advances and technological developments that inform translation to clinical care. NIDCD encourages basic research collaborations that span the traditional and emerging disciplines of life, physical, engineering, computer, behavioral, and social sciences.

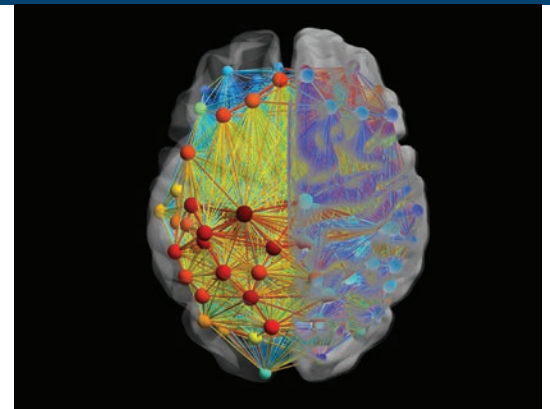
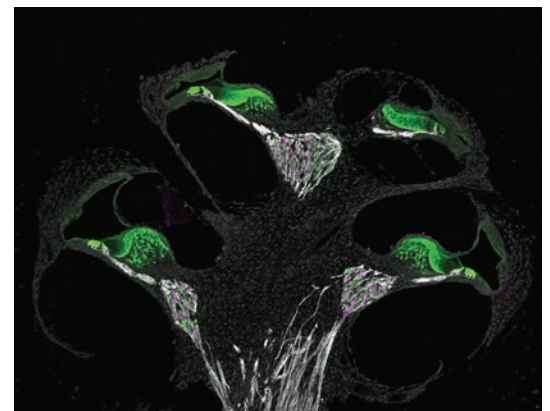


Illustration of the neurological connections in the brain controlling speech production.

Credit: Stefan Fuertinger, Ph.D. and Kristina Simonyan, M.D., Ph.D., Icahn School of Medicine at Mount Sinai.



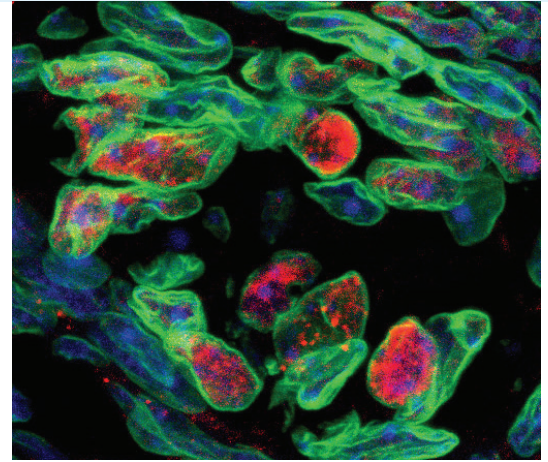
Microscopic image showing neurons in a mouse inner ear that relay sound signals to the brain.

Credit: Tessa Sanders, Ph.D., NIDCD/NIH.



Goal 1: Identify and characterize different cell populations in both peripheral and central regions.

Hearing, balance, taste, and smell depend upon highly specialized cells to detect and process sensory information. Understanding the cell types in sensory organs and the peripheral and central nervous systems is critical to the development of fundamental knowledge to guide future treatments. NIDCD encourages investigators to identify and characterize the molecular, cellular, anatomical, and functional properties of cells that are important for communication, and to discover how normal function can be disrupted in normal aging, diseases, and disorders in both model organisms and human tissue, across the lifespan.

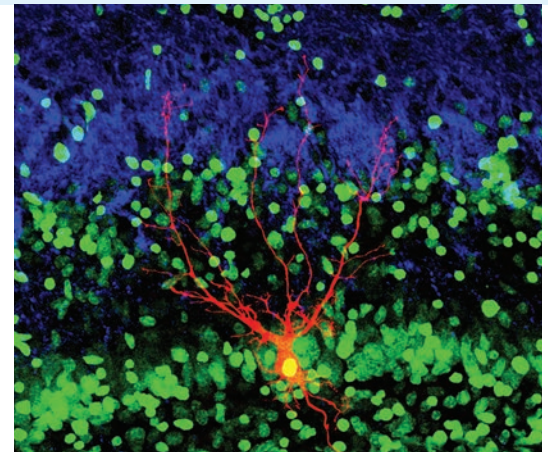


Some cells in the mouse tastebud express a marker for a sugar sensor (red). Detection of sweet taste in the mouth plays an important role in food intake.

Credit: Karen Yee, Ph.D., Monell Chemical Senses Center.

Goal 2: Identify and characterize neural circuits involved in sensory processing.

Cutting-edge technological methods advanced by the NIH Brain Research Through Advancing Innovative Neurotechnologies® (BRAIN) Initiative allowed for the development of high-speed functional microscopy that enables scientists to image extremely rapid, physiological changes at the single-cell level and across the brain in small animal model systems. Next-generation electrode arrays allow simultaneous recordings from hundreds to thousands of neurons over time, providing unprecedented temporal resolution of neural circuits to produce a dynamic picture of brain function in larger animals. The Institute recognizes the importance of efforts to quantify behaviors and combine them with simultaneous recordings of brain activity in humans. NIDCD seeks multidisciplinary and innovative projects to identify and characterize the neural circuits that play a role in sensory processing for communication.



A developing mitral cell (red) in the olfactory bulb of a mouse exhibits multiple contacts with incoming sensory axons (blue). Mitral cells carry olfactory information from the olfactory bulb to the rest of the brain.

Credit: Adam C. Puche, Ph.D., University of Maryland.

NIDCD encourages research to:

- Develop a dynamic map of brain circuits involved in specific sensory pathways
- Examine the neural circuits and computations that underlie multisensory interactions in communication processing
- Determine the conservation of circuits in a sensory system across species
- Identify the changes to circuits when compromised by sensory and communication deficits

IMAGINE THE FUTURE...

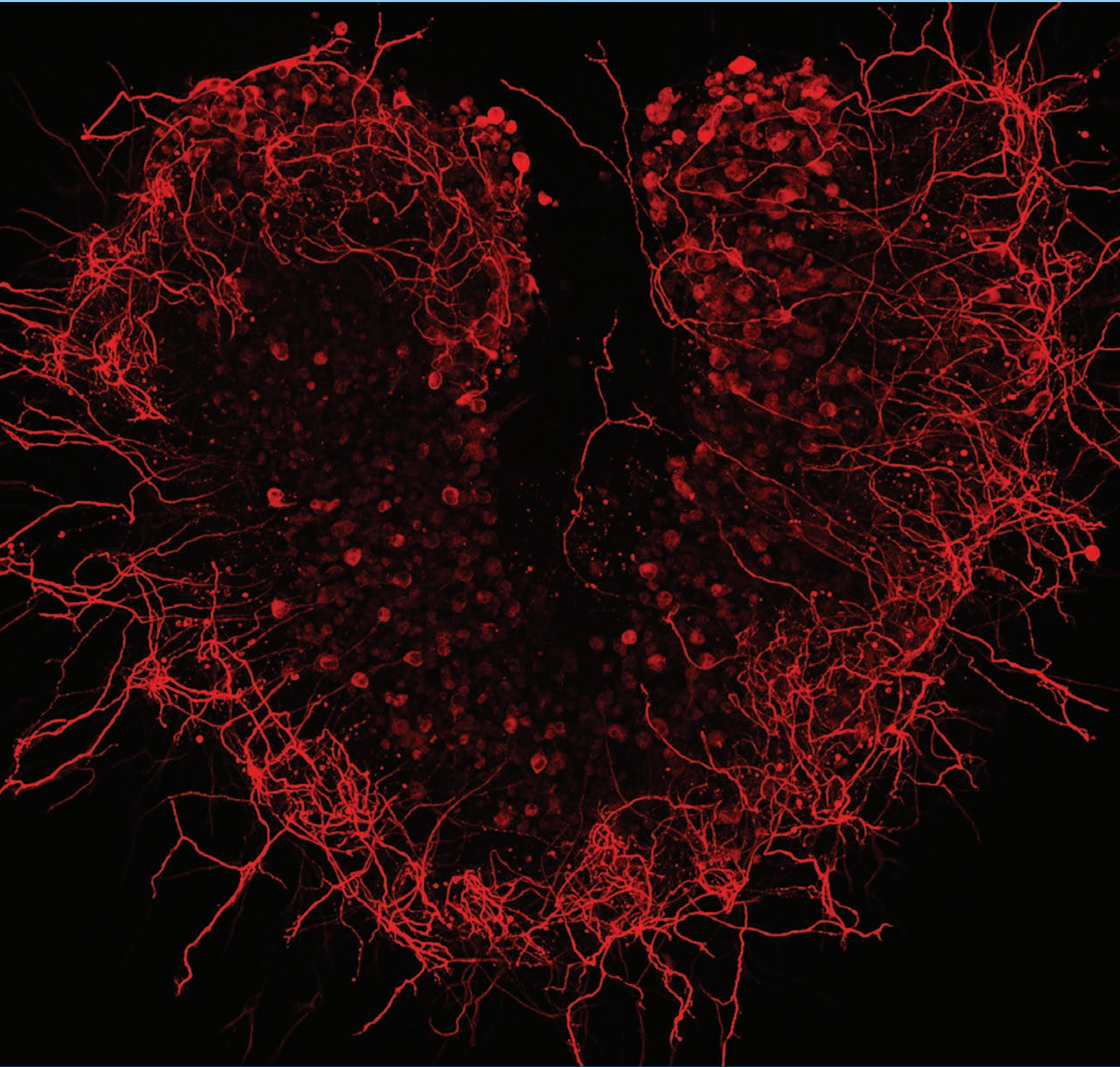
People with vocal fold injury can regenerate the cells needed to restore function.

Goal 3: Facilitate the utilization of biopsied and postmortem human tissue to advance research.

Working toward the goal of translating basic research to clinical research, studies using animal models may require validation in human tissue. In order to provide a critical link from animal studies to human tissue and eventually to clinical practice, NIDCD seeks to improve current techniques for the processing and use of donated human temporal bones, brains, and other sensory tissues. NIDCD encourages the incorporation of human tissue studies to complement current work using animal models for normal and disordered communication. New and/or improved methods are needed for characterization and analysis of human tissue, such as immunohistochemistry; multi-modal, multi-omic sequencing and analyses; and other emerging techniques. NIDCD encourages researchers to consider how to best use new imaging techniques and tissue preservation methods to study human temporal bones, brains, or other sensory tissues with a goal toward improved understanding of human communication disorders, ultimately, *in vivo*.



The human middle and inner ear are encased within the temporal bone (red).



In vitro culture of spiral ganglion neurons from the cochlea of the inner ear.

Credit: Alain Dabdoub, Ph.D. and Mirko Scheibinger, Ph.D., Stanford University School of Medicine.

Goal 4: Define interactions between immune-mediated networks and the influence of inflammation on normal and disordered function.

The immune system protects the body from foreign substances, such as potentially infectious agents and toxins, and responds to injury and repair of damaged tissue. The role of the immune system in communication disorders is not well understood. Because immune cells can contribute to both tissue injury and tissue repair, the signals that mediate these responses must be better characterized and defined in sensory systems. NIDCD recognizes the interplay between the nervous system, the endocrine system, and the immune system, and the need to better understand these processes to improve our ability to prevent and treat communication disorders. Resolving this knowledge gap is critical for the prevention and treatment of communication dysfunction. It is important to define the immune cell types and signaling mechanisms that contribute to communication function and dysfunction. NIDCD encourages new approaches to modulating immune responses to viruses (including COVID-19), bacteria, and/or injury that impacts sensory and communication function. The goal is to promote tissue repair and regeneration while reducing immune responses that damage sensitive cells, tissues, and organs needed for effective human communication.

IMAGINE THE FUTURE...

People with recent exposure to potentially damaging noise may take a pill that prevents permanent loss of hearing.



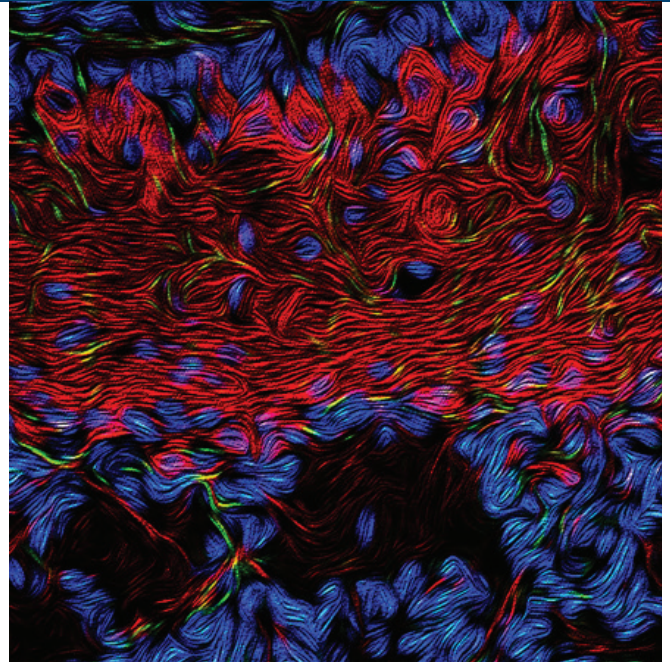


Theme 2: Develop and improve model systems to inform research.

NIDCD sees a continued critical need for the development of relevant model systems to study normal and pathologic conditions in human communication. The Institute encourages the development of new pre-clinical, *in vivo*, *in vitro*, and *in silico* model systems, as well as the improvement of current models to inform research and future clinical translation, leading to effective treatments.

A thick mesh of neurons in a mouse olfactory bulb. The olfactory bulb, a structure found in all vertebrates, processes odor input detected by the nose.

*Credit: Jeremy McIntyre, Ph.D.,
University of Florida College of Medicine.*



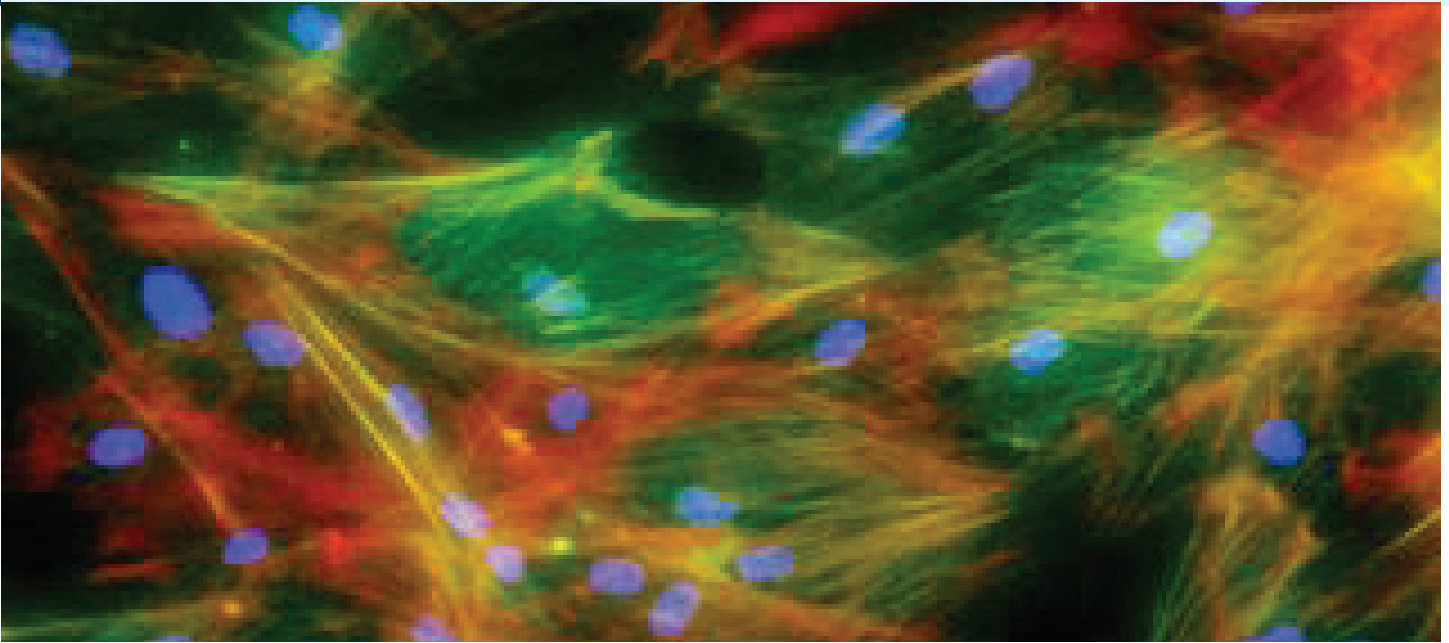
Goal 1: Develop robust *in vivo* and pre-clinical models to study normal and disordered function.

NIDCD seeks to support research on *in vivo* models to deepen our understanding of the mechanisms underlying normal and disordered function of the systems involved in human communication. By defining what is normal in animal models and humans, researchers can better understand underlying causes of communication disorders. In addition, optimization of novel therapeutics is usually dependent upon pre-clinical evaluation in animal models or *ex vivo* model systems. Such models can help to inform the decision to advance a therapeutic candidate to clinical testing and can provide valuable data for clinical study design. NIDCD encourages development of new pre-clinical models to provide an improved translational toolkit that will better predict the efficacy and safety of new therapeutic strategies for treating communication disorders.

IMAGINE THE FUTURE...

Researchers use pre-clinical models to identify drug targets to treat stuttering in children and adults.

Goal 2: Develop *in vitro* models to accelerate basic studies and high throughput screening.



Fluorescent labeling of human vocal fold fibroblast cells during wound healing. Researchers hope studying vocal fold wound healing will lead to treatments for millions of people who have voice disorders.

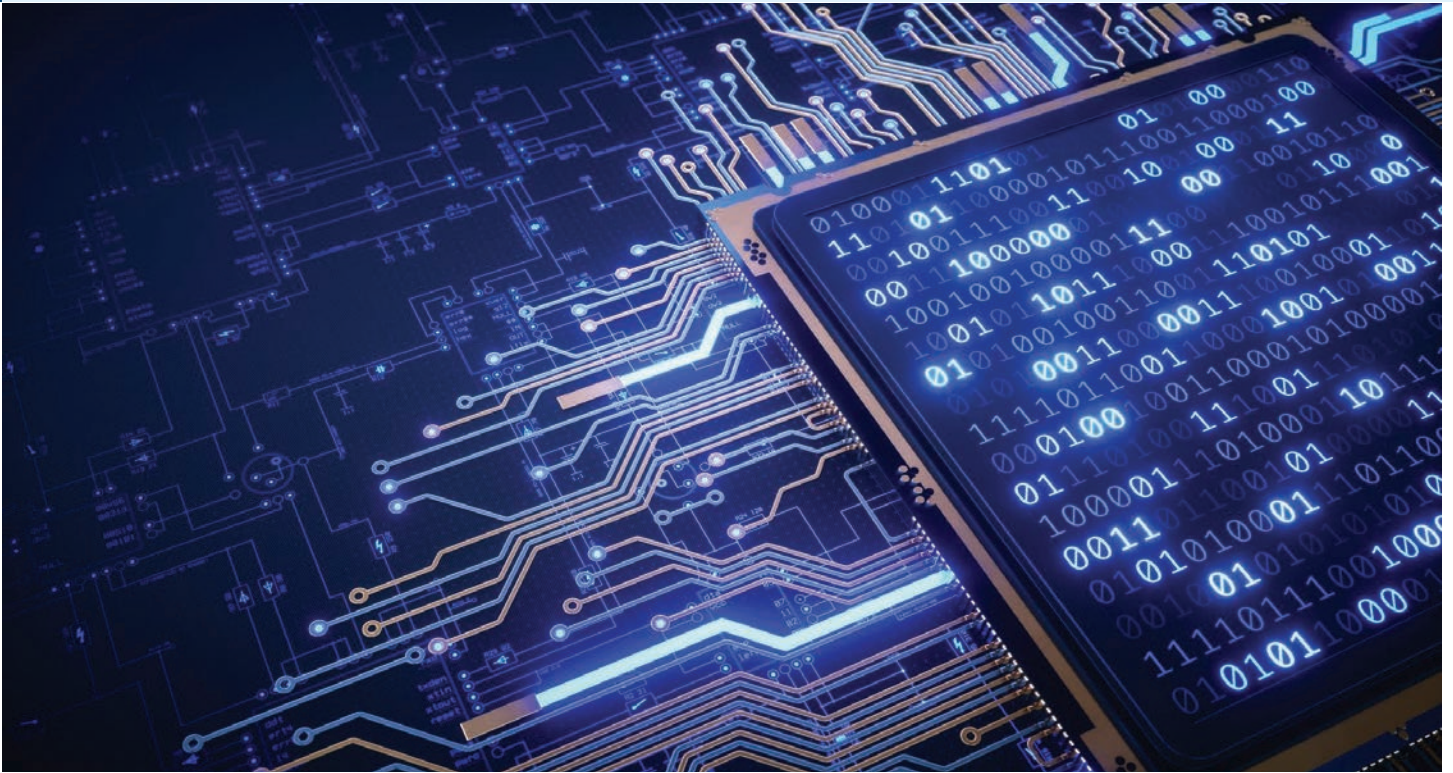
Credit: Anete Branco, Ph.D., and Susan Thibeault, Ph.D., University of Wisconsin-Madison.

Cell-based assays and *in vitro* models can expedite translation of basic research discoveries into more specific disease models. Such models may include new organ system platforms (i.e., “organs on chips”), or bioengineered platforms that can generate 3-dimensional models of the organ systems (i.e., organoids) from human cell sources. These models reproduce critical molecular, anatomical, mechanical, and physiological features that mediate tissue and organ function, allowing efficient monitoring and interrogation of normal and disordered processes as well as the testing of potential therapeutics. This type of *in vitro* model system can bridge the gap between pre-clinical testing in animals and human clinical trials, thus improving safety and efficacy of new treatments in humans while also potentially reducing the cost and time needed for development of therapies. NIDCD encourages the continued development of cell-based assays and other *in vitro* models for high-throughput or high-content studies, as well as disease-specific research.

IMAGINE THE FUTURE...

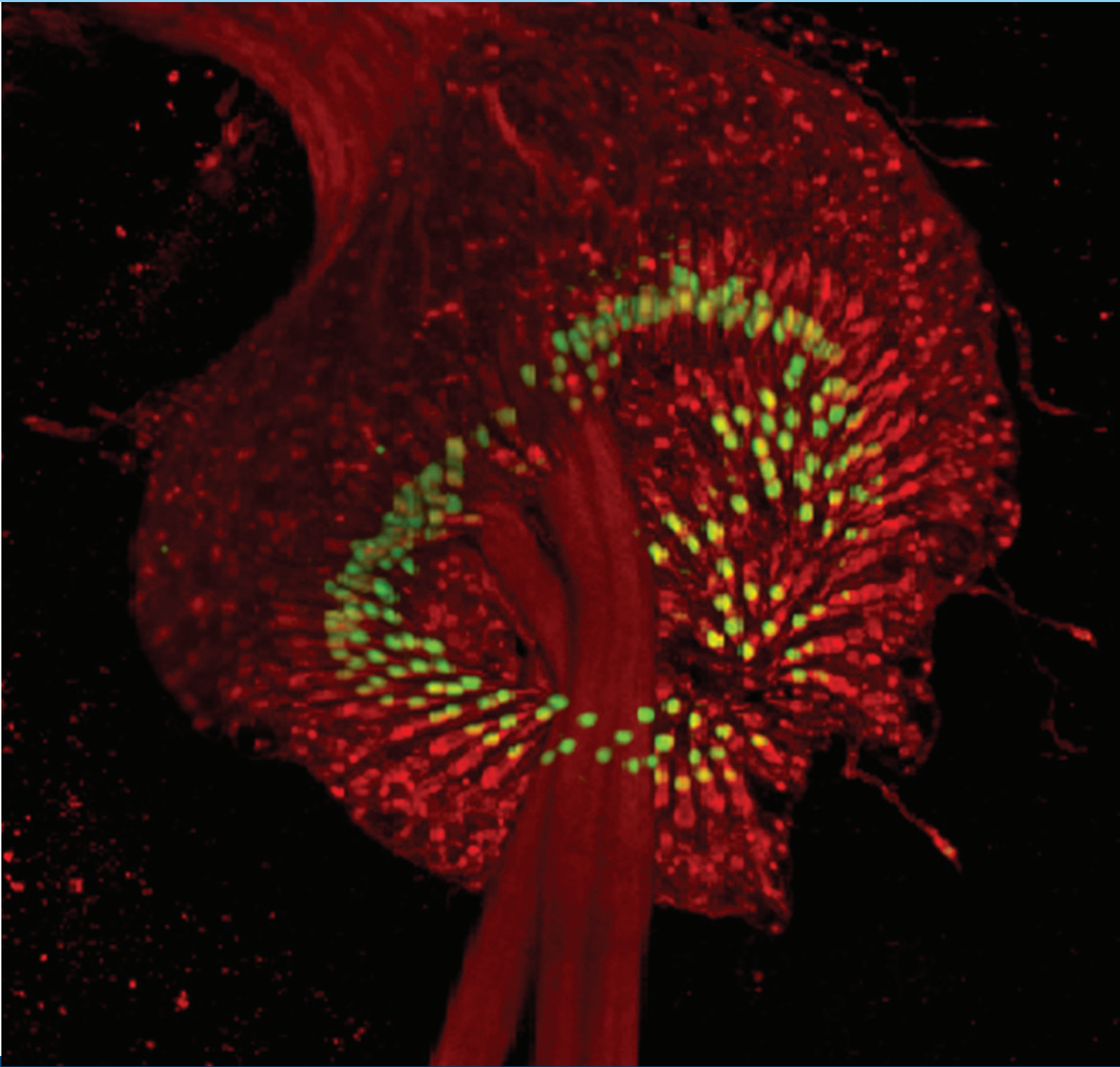
A ‘tissue chip’ containing miniature versions of taste buds or olfactory epithelium allows researchers to screen for and accelerate development of safe and effective therapies for chemosensory loss.

Goal 3: Develop *in silico* (computer) models to enable insights into normal and disordered function.



In silico modeling uses computing power to model complex biological processes. It combines the advantages of both *in vivo* and *in vitro* experimentation, but without being subject to the ethical considerations and lack of control associated with *in vivo* experiments and without the restrictive parameters associated with *in vitro* experiments. *In silico* models allow the researcher to run multiple, repeated simulations of biological, behavioral, and/or social processes while tightly controlling for variables to predict how systems perform. The development of models and the use of simulation are powerful adjuncts to improving the predictive value of collected data.

The establishment, maintenance, manipulation, and/or characterization of *in silico* models provides the resources and components for future development of new platforms to model pathways and outcomes, including the selection of appropriate *in vivo* and *in vitro* models for an organ system. NIDCD encourages research in experimental neuroscience and in physical, computer, mathematical, and engineering sciences to develop *in silico* models that are useful for studying normal or disordered functions of communication and to integrate such models into research project design.



The nerve in the Drosophila's (fruit fly's) antenna passes through a ring of sensory units. Neuron membranes are red, and the tips of the sensory neurons are green.

Credit: Andy Groves, Ph.D., Baylor College of Medicine.

Theme 3: Promote a precision medicine approach to prevention, diagnosis, and treatment.

Precision medicine considers individual differences in genes, behavioral phenomena, environments, and lifestyles in the clinical decision-making process. A significant goal of precision medicine is, at the individual level, to deliver the right intervention at the right dose at the right time, and to integrate this approach broadly when developing novel therapies and interventions for clinical care. Tailoring medical treatments for people who are deaf, hard-of-hearing, or presenting with sensory or communication disorders requires an ability to identify specific populations based on their biology to help determine their risk of developing certain conditions and predict their response to a specific treatment. Behavioral, environmental, and lifestyle data are important determinants of health status and should also be considered in precision medicine strategies. NIDCD encourages research to promote the identification of specific subpopulations based on biomarkers, risk factors, and other assessments that would improve diagnostic accuracy and facilitate development of targeted therapies.

Goal 1: Accelerate the acquisition and ethical use of genetic and phenotypic data.

Comprehensive datasets such as whole-exome and whole-genome sequencing; linkage analyses; epigenetic and gene expression profiles; tissue banks; blood and serum samples; biopsy specimens; electronic health records; and lifestyle and behavioral or social-factor data are needed for scientists to advance precision medicine research efforts. These datasets should be accessible to the scientific community, but in the context of respect for and protection of an individual's privacy and confidentiality. All researchers must consider the stewardship, intellectual property, reciprocity, and ethical use of these data. With these considerations in mind, NIDCD encourages research that will obtain, characterize, and catalog data on the impact of and interactions between genetic, phenotypic, and biological data and clinical, environmental, behavioral, social, and lifestyle factors, to serve as a resource to advance the understanding of the various forms of deafness, communication, and other sensory disorders.

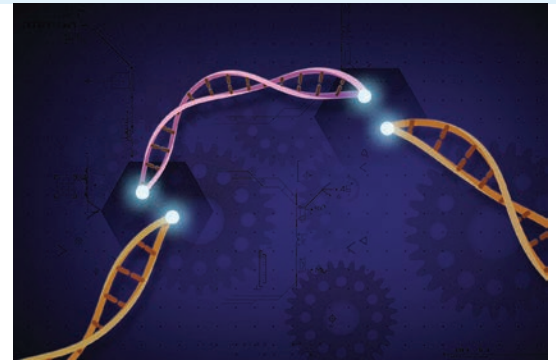
IMAGINE THE FUTURE...

People using prescription drugs to treat cancer or serious infections receive an additional treatment to protect their hearing from being damaged by these lifesaving drugs.



Goal 2: Develop genetic and cellular therapies.

NIDCD seeks research that leads to the development of targeted treatments including delivery vehicles, gene editing tools, gene repair/correction, and site-specific, controlled, and sustained molecular therapies for communication disorders. This goal includes development of therapies to prevent loss of sensory function and/or to restore function after loss has occurred. Further, targeted molecular and cellular therapies are needed to improve neuronal function, resist cell damage from internal and external stressors, and enhance cell repair. NIDCD also encourages studies designed to elucidate the properties that enable stem cells in the sensory organs and the central and peripheral nervous systems to proliferate and differentiate, advancing not only the treatment of sensory and communication disorders, but also other neurological diseases. While NIDCD encourages targeted approaches to treatment, the Institute also encourages and values development of treatments that can impact different disorders that share common phenotypes (observable characteristics.)



CRISPR-Cas9 is a customizable tool that allows scientists to make edits in precise areas along a DNA strand. This enables the specific and targeted examination of genes and can potentially be used as a form of gene therapy to treat disease processes.

Credit: Ernesto del Aguila III, NHGRI/NIH.

IMAGINE THE FUTURE...

Doctors can identify young children who have an increased likelihood of developing minimally verbal autism to begin targeted and appropriate interventions for effective communication.

Goal 3: Identify and develop interventions targeted to specific subpopulations.



Caregiver holding electroglottograph (EGG) electrodes on a child's throat to measure vocal fold vibration when the child vocalizes. Researchers are using EGG to determine when and why voice quality differences begin to develop in autism.

Credit: Shweta Ghai, Ph.D., Marcus Autism Center, Children's Healthcare of Atlanta, and Department of Pediatrics, Emory University School of Medicine.

Precision medicine approaches for prevention, detection, and treatment of disorders and conditions have immense potential to improve health outcomes for individuals who are deaf, hard-of-hearing, or presenting with other communication disorders. Such approaches will allow clinicians to select specific treatments based on an individual's genetic, molecular, physiological, imaging results, or other biomarkers. NIDCD encourages research to develop interventions that can be applied to subpopulations, with consideration of environmental and social differences, and that may result in improved individualized clinical care and better quality of life for those with sensory and communication disorders or conditions.



Hearing Screening Day in a remote community school in rural northwest Alaska during the Hearing Norton Sound cluster-randomized controlled trial.

Credit: Samantha Kleindienst Robler, Au.D., Ph.D., Norton Sound Health Corporation and Center for Hearing Health Equity, University of Arkansas for Medical Sciences (UAMS) and Susan D. Emmett, M.D., M.P.H., Center for Hearing Health Equity, UAMS.

Theme 4: Translate and implement scientific advances into standard clinical care.

NIDCD encourages the translation of basic biomedical or behavioral research discoveries into new clinical tools, prostheses, assistive devices, behavioral therapies or interventions, and medications to ameliorate communication disorders. Translational research is facilitated by collaborations and interactions between basic scientists and clinical scientists. These interactions provide the platform for the bidirectional exchange of ideas, stimulate new avenues of research, and accelerate the advancement of basic research findings into the clinic.



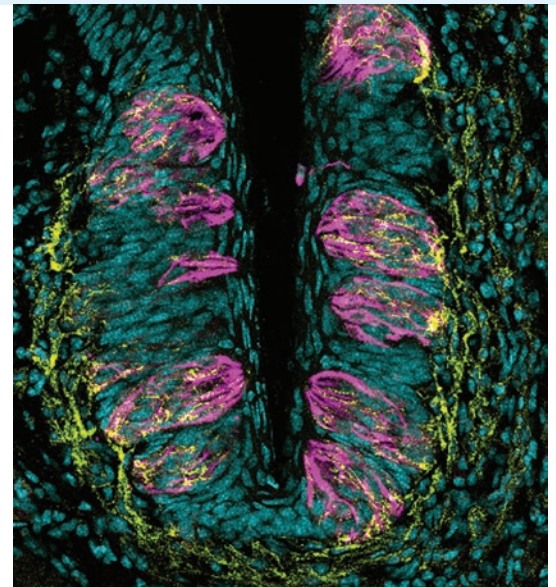
IMAGINE THE FUTURE...

Medical providers routinely use smell tests to identify people more likely to develop dementia and other neurodegenerative disorders.

NIDCD recognizes that increased dissemination and implementation research is needed to bridge the gaps between basic research, clinical implementation, and public health policy, by building a knowledge base about how health information, effective interventions, new clinical practices, and guidelines and policies are communicated and integrated into public health and health care service use in specific settings. Despite scientific and technological discoveries that have improved the health of the U.S. population overall, racial and ethnic minorities, persons with disabilities, socioeconomically disadvantaged populations, underserved rural populations, and sexual and gender minorities experience health disparities and continue to bear disproportionate burdens of disease and illness. NIDCD encourages research to improve the health, emotional well-being, and quality of life of all individuals impacted by conditions and disorders that fall within the NIDCD mission.

Goal 1: Accelerate the development of treatments.

Significant scientific advances have improved our understanding of the pathophysiology of many communication disorders. In contrast, clinicians struggle to treat patients who have disorders for which the underlying mechanisms are unknown. The scientific community is poised to develop better treatment and prevention strategies for many disorders in our mission areas using innovative approaches and leveraging knowledge and new technologies from related fields of research. NIDCD sees great opportunities to improve human health in areas such as vaccine development, collaborations between interdisciplinary scientists, novel interventions, repurposing of drugs approved by the U.S. Food and Drug Administration (FDA), bench-to-bedside research, and bedside-to-bench research to prevent and treat communication disorders. NIDCD seeks research that uses the Small Business Innovation Research/Small Business Technology Transfer Programs to commercialize novel therapies and devices to treat or prevent communication disorders. NIDCD encourages effective treatments that consider a whole person approach and additional biological, behavioral, psychological, and social research on both humans and animal models.

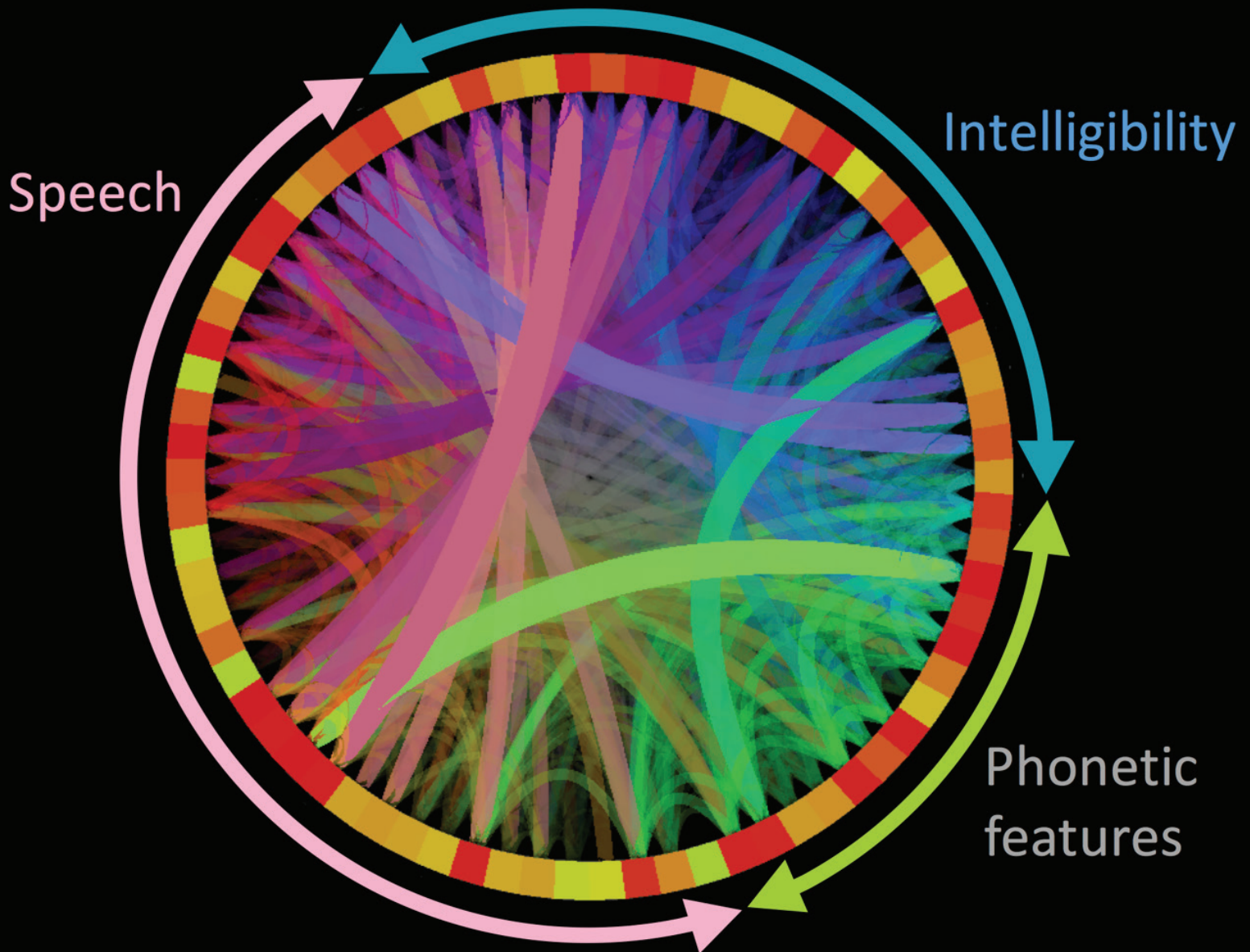


Taste papilla on the tongue containing taste buds (pink) that send information through taste nerve fibers (yellow) to the brain. Researchers studying taste bud regeneration hope to develop ways to help people who are unable to fully regenerate taste buds, such as after cancer treatment.

Credit: Dany Gaillard, Ph.D., and Linda Barlow, Ph.D., University of Colorado Anschutz Medical Campus.

IMAGINE THE FUTURE...

Vaccines that prevent otitis media (ear infections) eliminate this major cause of hearing loss, ear disease, pain, and stress for children and their families.



Human brain speech functional connectivity in 6-14-year-olds.

Credit: David R. Moore, Ph.D., Cincinnati Children's Hospital.

Goal 2: Develop, disseminate, and implement evidence-based practices to improve health-related outcomes.

NIDCD aims to support research that will close the gap between basic biomedical and behavioral discovery and population health and health care delivery for deafness and communication disorders. When developing evidence-based practices, researchers should consider racial, ethnic, and cultural diversity, as well as disability, gender, and other social determinants of health such as socioeconomic status and education. NIDCD encourages dissemination and implementation research to identify, understand, and address barriers to the adoption, adaptation, sustainability, and integration of evidence-based interventions, tools, and policies.

Goal 3: Promote health equity and improve access to clinical care.

NIDCD seeks to support more research that advances the understanding or reduces the impact of health disparities and inequities in communication disorders among racial/ethnic minorities and other underrepresented populations. Tackling the complex drivers of health disparities requires strong partnerships among researchers, community representatives, community organizations, health service providers, public health agencies, and policymakers to ensure that relevant and culturally and contextually appropriate research is conducted, and that findings can be translated into sustainable community- and system-level changes that promote health equity. NIDCD wants to ensure that individuals who are deaf, hard-of-hearing, or presenting with communication disorders are active participants in the research. Their voices, experiences, and perspectives are critically important to the development of equity, accessibility, and person-centered care. NIDCD encourages innovative clinical and translational research that provides the foundation for improving accessible and affordable health care for these individuals.



The Hear Here Alabama mobile audiology clinic travels to rural communities to provide access to hearing healthcare.

Credit: Marcia Hay-McCutcheon, Ph.D., the University of Alabama.



Reputation

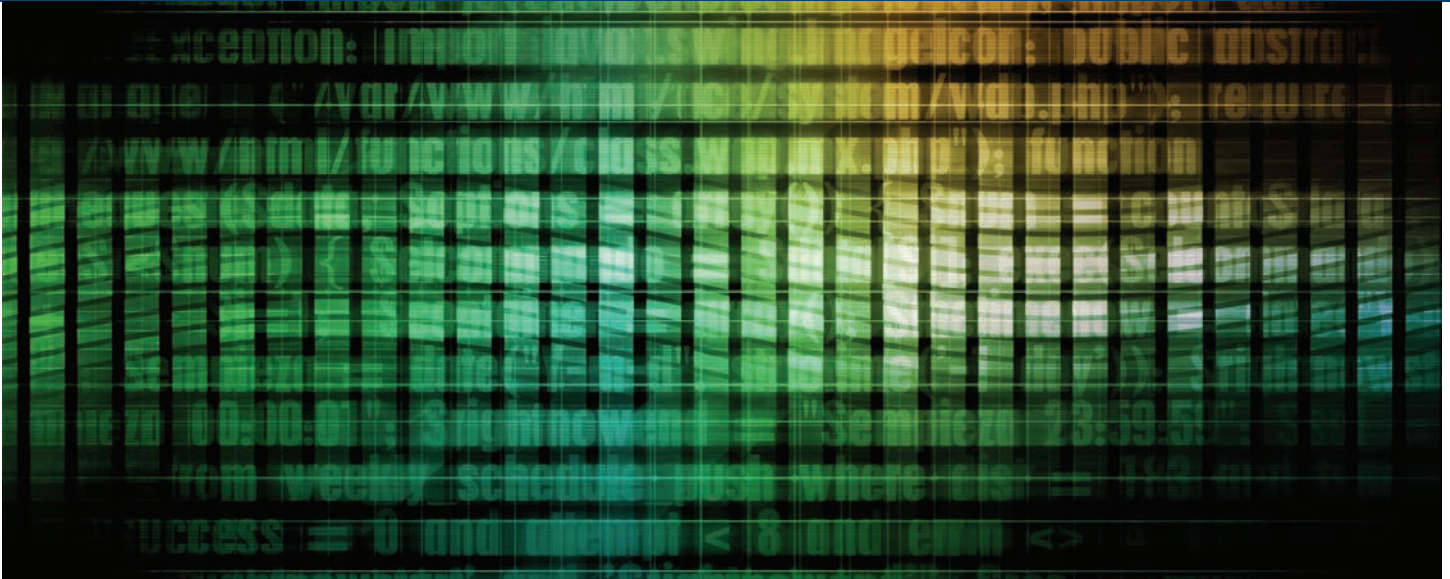
CRM

Quality

**DATA
SCIENCE**

Plan

Theme 5: Facilitate use of and best practices in biomedical data science.



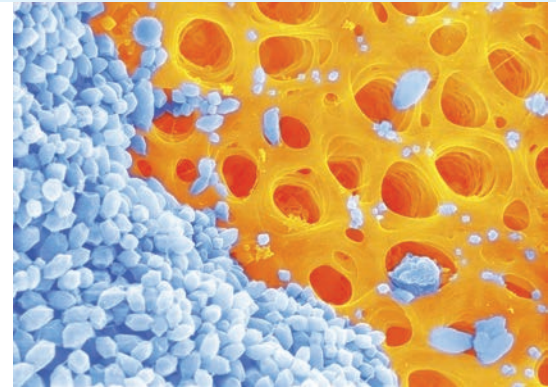
In alignment with NIH-wide priorities outlined in the NIH Strategic Plan for Data Science (https://datascience.nih.gov/sites/default/files/NIH_Strategic_Plan_for_Data_Science_Final_508.pdf), NIDCD seeks to maximize the value of data generated through NIDCD-funded research by prioritizing efforts to share biomedical and behavioral data in ways that encourage ongoing use by the entire scientific community. Widespread access to shared data, along with other advancements in data science, create a unique opportunity to accelerate the discovery of insights that will improve the lives of millions of people with communication disorders. Shared scientific data accelerate biomedical research discovery, enable validation of research results by independent groups, improve accessibility to large datasets that allow researchers to address high impact questions through secondary analyses, and promote data reuse across research studies. The data in repositories—such as data from model organisms; clinical, observational, and longitudinal studies; patient registries; and population-based epidemiological and statistical studies—should be standardized and structured in such a way that they are usable and interoperable with other repositories. Standard data elements that use controlled vocabularies or ontologies enable the use of machine learning to mine existing data. NIDCD encourages the management and sharing of scientific data generated from research.

IMAGINE THE FUTURE...

Selecting targeted therapies for aphasia is made possible by artificial intelligence (AI)-assisted diagnostic tools.

Goal 1: Inform the development and use of standardized outcome measures for basic and clinical research.

In recent years, progress in basic research has resulted in identification of underlying disease mechanisms in several of the NIDCD mission areas. While this progress is highly encouraging, one obstacle to the demonstration of efficacy in human trials has been the lack of widely accepted test strategies and endpoints to assess improvement in function. The development of standardized outcome measures in basic and clinical research will allow for unbiased analysis, interpretation, and reporting of results. Such standardized measures of behavioral and health outcomes will facilitate cross-study comparisons and improve the interpretability of research findings and translation into evidence-based clinical practice. NIDCD encourages the development of standardized outcome measures that are quantifiable, objective, and correlate with clinically meaningful changes in the underlying condition to create opportunities for comparison or combination of data across studies and lend statistical power to subgroup analysis.



Calcium carbonate crystals in the utricular macula, a sensory organ of the inner ear, are important for our sense of balance.

Credit: Bechara Kachar, M.D., NIDCD/NIH.

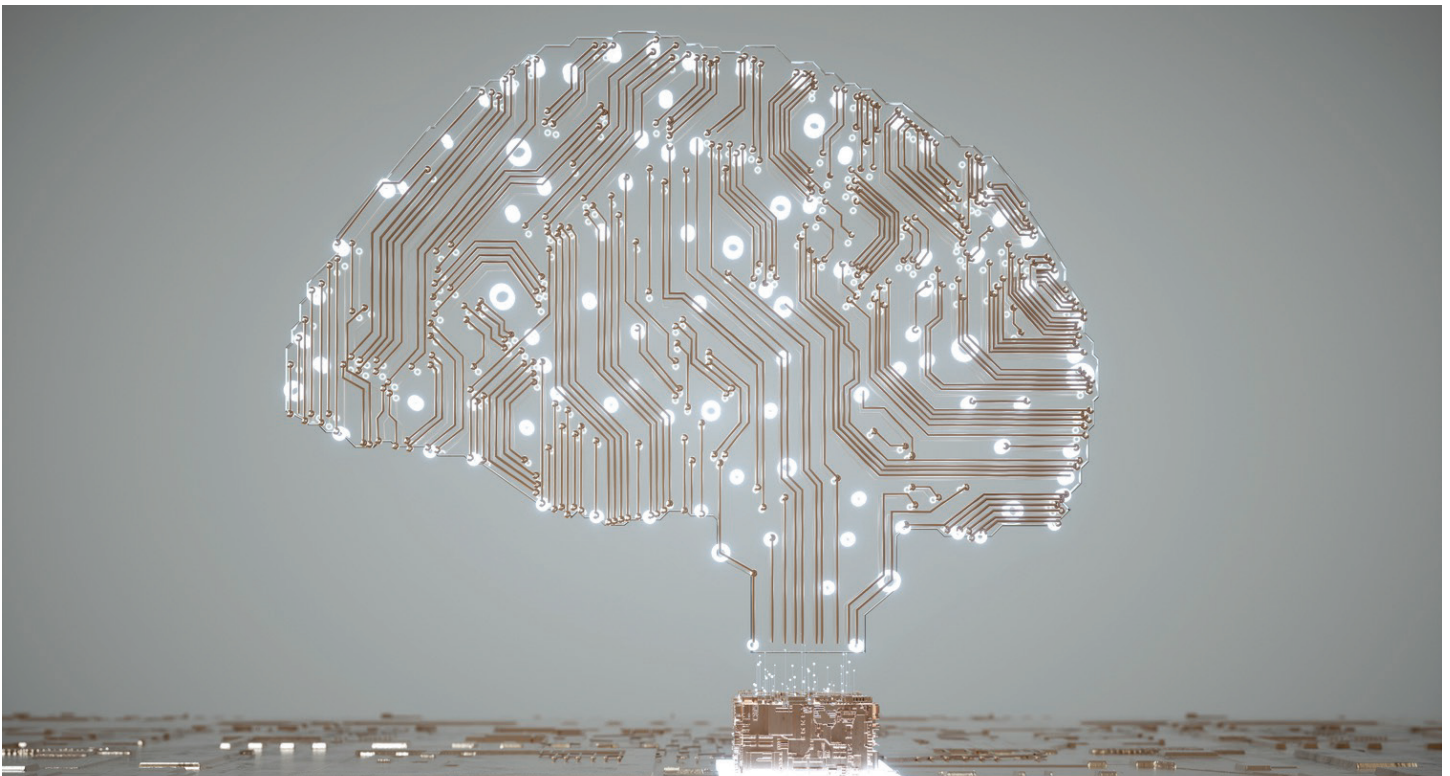
Goal 2: Encourage the use of data repositories to share findable, accessible, interoperable, and reusable (FAIR) data.

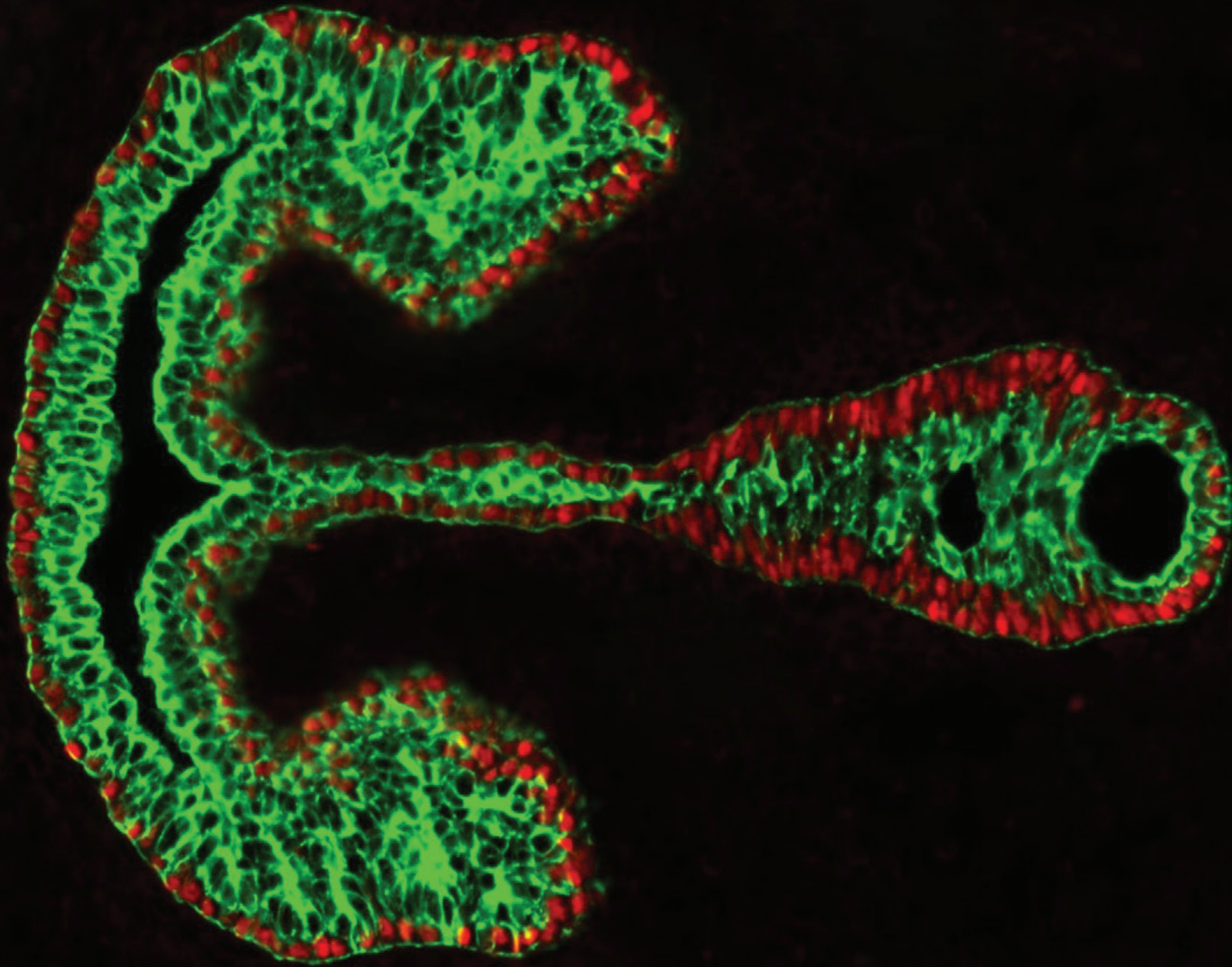
Biomedical research generates data for multiple variables and produces large datasets. By adhering to FAIR data principles, researchers and data scientists establish a culture of data sharing that fully leverages these valuable resources. The FAIR principles, using data and metadata standards (ontologies, taxonomies, terminologies), facilitate reuse of data and the ability to combine data from different sources to support inquiry using modern computational tools. FAIR data allows repositored datasets to be maintained, queried, and reconfigured to facilitate new analyses, which contributes to a cost-effective and efficient resource for advancing research. NIDCD will continue to partner with the NIH Office of Data Science Strategy in activities aimed at modernizing the biomedical research data ecosystem. NIDCD encourages investigators to generate biomedical research data that adheres to FAIR principles.

Goal 3: Develop artificial intelligence and machine learning algorithms that provide novel insights and applications for prevention, diagnosis, and treatment.

Computational approaches that include artificial intelligence and machine learning (AI/ML) technologies present a tremendous opportunity for data-driven discovery across the NIDCD's mission areas. AI/ML approaches enable researchers to recognize patterns in large volumes of data, extract relationships between complex features in the data, and identify characteristics in data (including images) that were not previously discerned by conventional analytic processes. AI/ML technologies, which includes deep learning and neural networks, are quickly becoming an integrated part of many areas of biomedical, behavioral, and clinical research. AI/ML can be applied to large quantities of biomedical data to generate new insights and applications for improved prevention, diagnosis, and treatment of communication disorders.

As new sources of biomedical and health data emerge, the amount of information will continue to grow faster than can be interrogated using conventional methods. AI/ML will be an essential tool for processing, aggregating, and analyzing the vast amounts of information to drive discovery and improve patient care. NIDCD encourages multidisciplinary collaborations among computer or information scientists; engineers; and social, behavioral, biomedical, cognitive, and/or economic scientists to improve the fundamental understanding of biomedical and health-related processes related to NIDCD's mission.





Developing mouse vocal fold tissue; double stained to show cytokeratin K8 (green) and p63 gene expression (red).

Credit: Vlasta Lungova, Ph.D., and Susan Thibeault, Ph.D., University of Wisconsin-Madison.

Theme 6: Harness advanced technology to improve prevention, diagnosis, and treatment.

Technology has become integral to our lives, and its use is exploding in biomedical and behavioral research and in health care practice. Emerging technology has created critical tools, including instrumentation, methods, and software that can be applied to a wide variety of challenges in sensory and communication sciences. NIDCD recognizes the importance of seeking input from potential users of the technology, including individuals who are deaf, hard-of-hearing, or presenting with communication disorders. NIDCD encourages development of new technology to prevent disease; improve diagnoses, clinical decision-making, and treatment; and facilitate communication, ultimately leading to better health outcomes and quality of life.

Goal 1: Employ rational design principles to engineer novel solutions.

Advances in biomedical engineering, coupled with our ever-increasing understanding of complex biological systems, can help to develop novel approaches to restoring function. Our ever-increasing understanding of complex biological systems and biomedical engineering can be used to conceptualize novel approaches that restore function. Human factors are also complex and often play a significant role in the adoption and sustained use of new technologies. New clinical tools, prostheses, assistive devices, medications, and behavioral therapies should be developed as the technology needed to meet these requirements is identified. Rational design principles are based on systematic examination of alternatives, identification of variables that can be controlled, and establishment of appropriate boundary conditions. This process can lead to, for example, devices specialized for safe and prolonged drug delivery to the human inner ear, neural prostheses based on optical stimulation, and smart biomaterials that serve as a scaffold to encourage regeneration and repair of tissue. NIDCD encourages projects that use rational design principles to engineer therapies based on health and disease knowledge that continues to emerge from basic research.



IMAGINE THE FUTURE...

People who are nonverbal express themselves in real time using a personalized augmentative and alternative communication (AAC) system that is portable and lightweight.

Goal 2: Enhance augmentative and alternative communication capabilities.

Advances in technology have the potential to play an ever-increasing role in augmentative and alternative communication (AAC) devices that assist people who have complex communication needs. Innovations such as brain computer interfaces, which are based on computer translation of changes in brain activity derived from a user's intent, are examples of the potential these technologies hold for improving communication. Similarly, NIDCD seeks to support novel approaches to AAC integration. NIDCD recognizes AI/ML as tools that can facilitate normal communication and improve accessibility for those with communication disorders. Leveraging existing AI/ML for AAC devices expands the ease with which treatment strategies may be adopted by individuals who are deaf, hard-of-hearing, or presenting with communication disorders, as well as their families and caregivers. For children who have hearing loss or speech and language disorders, AAC devices can provide tailored interventions to match the context of the child's environment and integration into the child's acquisition of language. NIDCD encourages multidisciplinary teams that leverage expertise in neuroscience, engineering, and social and behavioral science to help millions worldwide who cannot rely on their hearing or speech to communicate.



An NIH-supported technology application called CoConstruct was developed for individuals with complex communication needs.

Credit: Melanie Fried-Oken, Ph.D., Oregon Health & Science University.

Goal 3: Develop specialized *in vivo* imaging capabilities to improve diagnosis and treatment.



NIDCD seeks to enhance the development and application of advanced imaging and computational approaches to disorders of human communication. *In vivo* imaging is an essential component in the development of biological advances and the clinical application of treatments of communication disorders. Systems-wide studies of the molecular and cellular pathways associated with NIDCD-related research areas will require that innovative imaging solutions be developed in a highly multidisciplinary environment. NIDCD encourages research technologies that enable imaging of living human tissue relevant to communication and communication disorders to enable precise diagnosis and the development of new and targeted treatments.

IMAGINE THE FUTURE...

People with inner ear disease see their health care provider for live imaging to enable precision diagnosis and treatment.

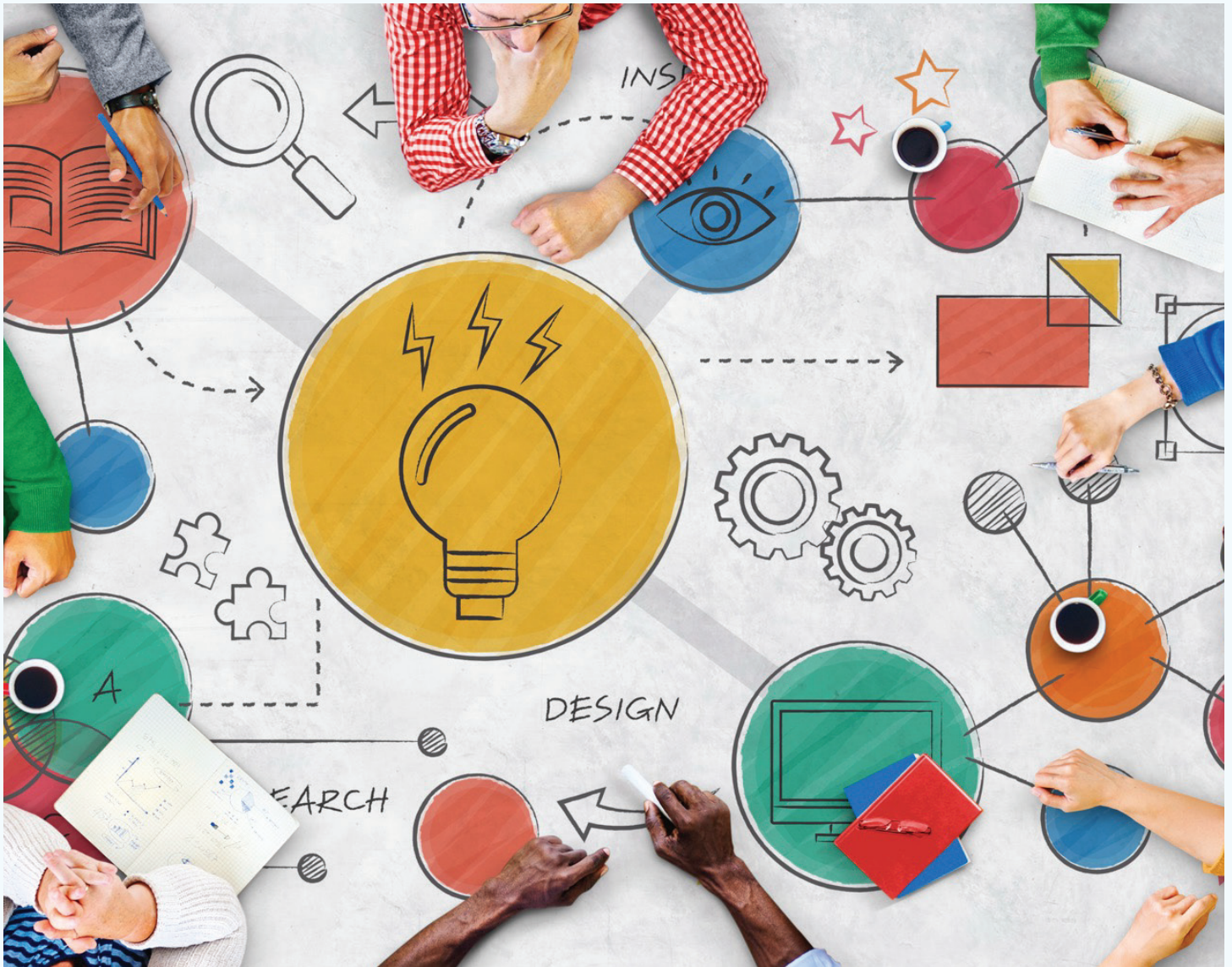


Measuring Progress

NIDCD will track progress on the themes and goals of this plan. Examples of progress may be new research advances, Funding Opportunity Announcements (FOAs), research projects, workshops, collaborative efforts, etc. NIDCD will share updates on our website.



Appendix A: NIDCD Strategic Planning Process



Pre-Planning

In the fall of 2019, the NIDCD's Science Policy and Planning Branch (SPPB) began the process of updating the 2017–2021 NIDCD Strategic Plan for research. NIDCD formed an Internal Strategic Plan Working Group (ISPWG) of NIDCD staff to guide the process. Membership of ISPWG included representation from all NIDCD divisions. ISPWG's roster is included below. In January 2020, ISPWG presented the strategic plan process and timeline to the NIDCD Advisory Council.

NIDCD published a Request for Information (NOT-DC-20-001, <https://grants.nih.gov/grants/guide/notice-files/NOT-DC-20-001.html>) in the NIH Guide for Grants and Contracts and in the Federal Register (FR Doc. 2020-01480, <https://www.federalregister.gov/documents/2020/01/29/2020-01480/notice-to-announce-request-for-information-to-assist-in-the-development-of-a-new-strategic-plan-for>) in early 2020 with five broad questions designed to solicit input about unmet public health needs and the public's ideas for how to advance NIDCD's research mission. This Request for Information was open for 60 days. SPPB reviewed all (383) submissions and summarized them for internal consideration as the Institute developed the new plan.

NIDCD performed several analyses to help guide decision-making during the strategic planning process. SPPB conducted a portfolio analysis (<https://videocast.nih.gov/watch=37917>, start at the 19 minute 23 second mark) of NIDCD-funded research projects and tied the project to Priority Areas in the 2017-2021 NIDCD Strategic Plan to describe what NIDCD is currently funding and to track progress. In order to describe the public health impact of disorders and conditions within NIDCD's mission areas, SPPB performed two additional analyses, including a literature review to describe disease frequency estimates for hearing, balance, taste, smell, voice, speech, and language disorders, and a collaboration with the Centers for Disease Control and Prevention's (CDC's) National Center for Health Statistics to estimate the annual number of physician visits based on ICD, or International Classification of Diseases codes for the most common communication and sensory disorders. ISPWG presented the results from these analyses to the NIDCD Advisory Council and to other scientific experts, members of the public, advocacy groups, and professional organizations at a public session of the Council.

Crowdsourcing New Ideas

The COVID-19 pandemic caused significant delays in the strategic planning process by preventing NIDCD from hosting in-person meetings to obtain input. NIDCD used a virtual crowdsourcing methodology based on Open Space Technology principles to gather ideas from scientific subject matter experts in the NIDCD's seven mission areas.



NIDCD hosted a virtual kickoff meeting in July 2021. ISPWG sought broad perspective by inviting more than 200 subject matter experts representing the extramural scientific community, program officials, and scientists from other NIH Institutes and Centers, two NDCD Advisory Council liaisons, and representatives from the FDA, CDC, Department of Veterans Affairs, Health Resources and Services Administration, Department of Defense, and the Centers for Medicare and Medicaid Services. In selecting the group, NIDCD considered career stages, educational levels, geographic locations, demographic information, gender, disability status, and under-represented minority representation.

At the July kickoff meeting, Dr. Tucci described the NIDCD's grassroots approach to developing the strategic plan, presented the results of the analyses described in the pre-planning phase, and invited the attendees to submit visionary ideas that would advance the NIDCD mission. The subject matter experts were asked to keep the public health needs in mind when formulating ideas. Dr. Tucci also presented an idea-collection template that NIDCD shared with invitees (OMB # 0925-0766) and asked them to collaborate and distribute this template to their colleagues

in other disciplines and in other fields of science. In December 2021, a subset of more than 100 subject matter experts was invited to a virtual idea-generation meeting to further discuss and refine submitted ideas and to generate new ones.

Drafting and Publishing the Strategic Plan

From January to April 2022, ISPWG reviewed and analyzed all the crowdsourced ideas and used them to develop strategic themes and goals for the plan. The draft themes and goals were made available for a 30-day public comment period on the NIDCD website in May 2022. To announce the public comment period, NIDCD published a Notice in the NIH Guide for Grants and Contracts (NOT-DC-22-008, <https://grants.nih.gov/grants/guide/notice-files/NOT-DC-22-008.html>) and a Notice in the Federal Register (FR Doc. 2022-09317, <https://www.federalregister.gov/documents/2022/05/02/2022-09317/national-institute-on-deafness-and-other-communication-disorders-draft-2022-2027-strategic-plan>). NIDCD received 379 comments from the public. After appropriate public comment input was incorporated into the draft themes and goals, ISPWG developed a full draft 2023–2027 Strategic Plan that was reviewed and approved by NIDCD staff, NIH leadership, and finalized for publication on the NIDCD website in late fall of 2022.

Appendix B: Liaisons from the National Deafness and Other Communication Disorders (NDCD) Advisory Council

Nirupa Chaudhari, Ph.D.

Professor, Physiology & Biophysics
University of Miami School of Medicine

Dan H. Sanes, Ph.D.

Professor, Center for Neural Science
New York University

Appendix C: NIDCD Internal Strategic Plan Working Group

Roster

Members	NIDCD Division, Office, or Branch
Wade Chien, M.D., FACS	Inner Ear Gene Therapy Program
Laura Cole, Ph.D.	Science Policy and Planning Branch
Judith Cooper, Ph.D.	Office of the Director
Lisa Cunningham, Ph.D.	Office of the Scientific Director and Section on Sensory Cell Biology
Janet Cyr, Ph.D.	Division of Scientific Programs
Joanne Karimbakas, M.S., R.D.N.	Office of Health Communication and Public Liaison
Lisa Kennedy, Ph.D.	Science Policy and Planning Branch
Kelly King, Au.D., Ph.D.	Division of Scientific Programs
Roger Miller, Ph.D.	Division of Scientific Programs
Cathy Rowe, B.S.	Science Policy and Planning Branch
Elka Scordalakes, Ph.D.	Science Policy and Planning Branch
Melissa Stick, Ph.D., M.P.H.	Scientific Review Branch
Susan Sullivan, Ph.D.	Division of Scientific Programs
Debara Tucci, M.D., M.S., M.B.A.	Office of the Director
Becky Wagenaar-Miller, Ph.D.	Division of Extramural Activities
Timothy Wheelles, M.A.	Office of Administration
Baldwin Wong, B.S.	Science Policy and Planning Branch