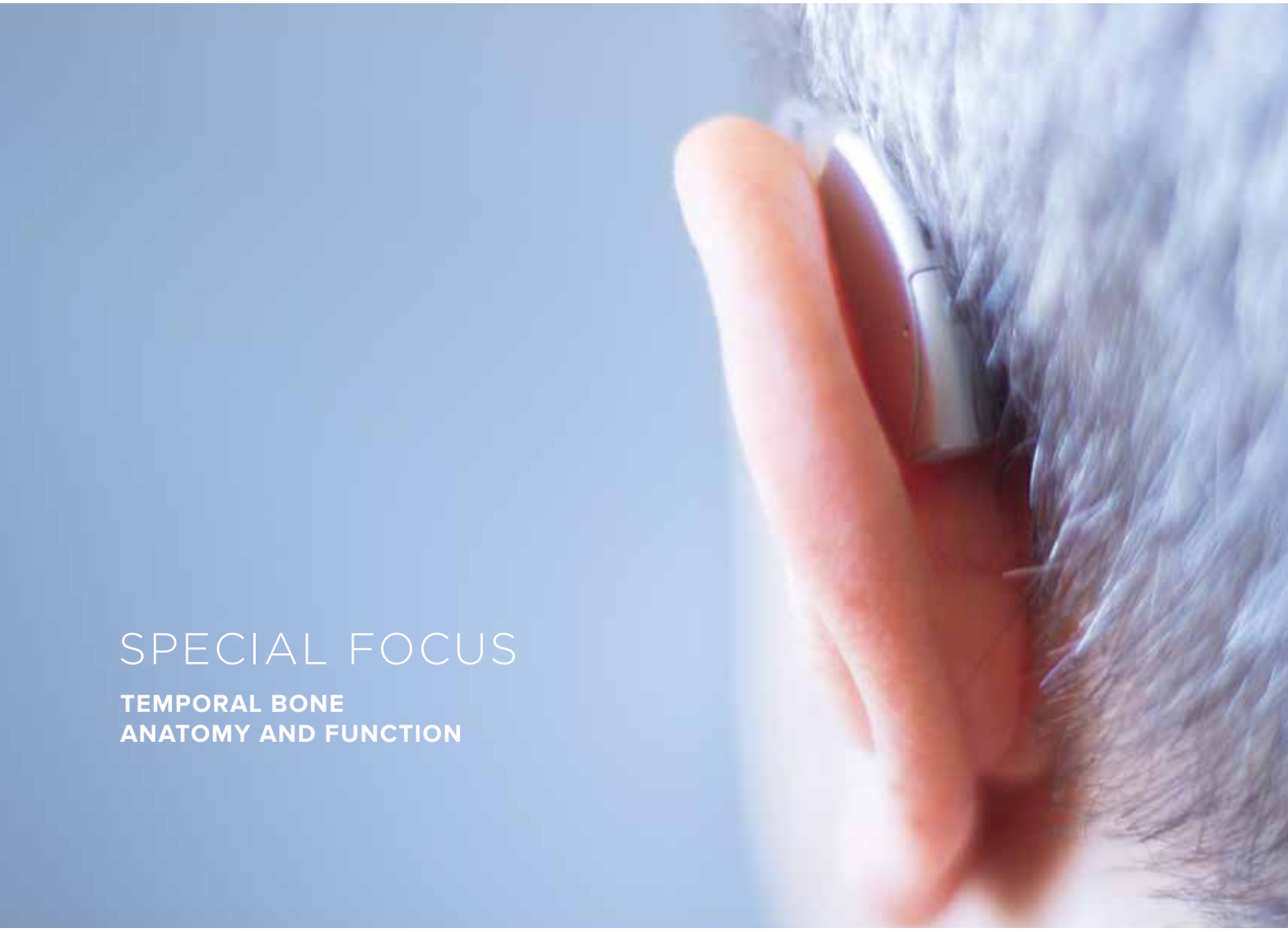
SUMMER 2020 | VOLUME 13 NO.02

HOUSE CALLS

A PUBLICATION ON RESEARCH, EDUCATION & GLOBAL HEARING HEALTH



SPECIAL FOCUS

TEMPORAL BONE ANATOMY AND FUNCTION

THE HOUSE INSTITUTE FOUNDATION

The House Institute Foundation (HIF, formerly House Ear Institute) aims to improve the lives of the deaf or hard of hearing by investing in neurological and ear research, education, and global humanitarian efforts. To join us on our mission of creating a world where all may hear, visit us at: www.HEI.org/donate.

THE HOUSE INSTITUTE FOUNDATION
FORMERLY HOUSE EAR INSTITUTE

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IN THIS ISSUE

WELCOME

It has been a challenging time for the world, but the current COVID-19 crisis has strengthened our resolve at the House Institute Foundation.

Amid this new pandemic, we have kept our sights on the numerous disorders and diseases that cause hearing loss, and their estimated impact. Without critical work in hearing and neuroscience research, education, and global humanitarian efforts, an estimated 900 million people will have disabling hearing loss by the year 2050. That is one in every ten people.

Inspired by individuals in the deaf and hard-of-hearing community who were innovating ways to communicate and stay connected under the directives of social distancing, we worked to understand how we could provide solutions as well. We have found a renewed passion for our endeavors in clinical research.

In March, we seamlessly transitioned to working from home, but as the world re-emerges, so too will the House Institute Foundation. There is much to do in the wake of the spring safer-at-home orders. Through this time, we remain committed to changing the future of hearing health. The world has never been more eager for good news. We need your help to deliver it. We are grateful for your ongoing support and ask that you continue to give now more than ever. Working together, we can have a positive impact on the world.

In Solidarity,

Jeremy Sidell
EXECUTIVE DIRECTOR

The House Institute Foundation

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WHAT'S NEW AT HOUSE

// NEW WORKSHOP FOR FURTHERING HEARING SCIENCE

Some ear and neurological disease treatments have not seen advancement in decades. To address this, the House Institute Foundation created the Hearing Science Accelerator. This workshop calls on experts from around the world, both inside and outside the medical community, to focus on a specific hearing-related disease in a formal academic setting to advance clinical and research outcomes. The first Hearing Science Accelerator will focus on acoustic neuromas and will take place in the winter.

// NEW AUDIOLOGY CURRICULA

Dr. Soo Jang, AuD, is working to create an audiology curriculum in response to the lack of a standardized care guide in underserved areas of Mexico. This curriculum will be translated and distributed worldwide.

// NEW REEARCH FUNDING PROGRAM

In spring, our research committee kicked off two new funding programs. One will stimulate small, focused projects that can be completed in one year. The other supports intermediate research projects that can be completed within three years.

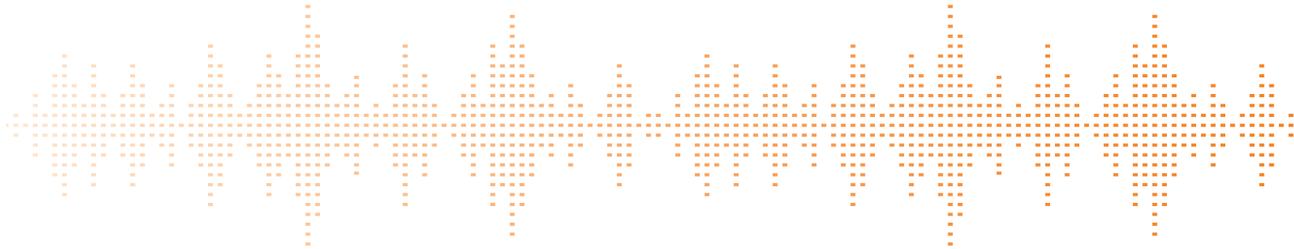
// GLOBAL NEUROTOLOGY EDUCATION CONTINUES

Prior to the COVID pandemic, House physicians traveled to France and Columbia to give lectures and speeches in neurotology. Then, when the world went digital, we followed suit, creating a web-based lecture series for neurotology fellows nationwide.

// THE HOUSE INSTITUTE FOUNDATION IS HIRING!

Visit www.HEI.org/careers or email jobs@hei.org for more information.

HEARING SCIENCE NEWS



Hearing Aids May Deter Dementia Symptoms

Researchers at the University of Melbourne fitted almost 100 deaf and hard of hearing seniors with hearing aids. Over the course of 18 months, they measured the participant's cognitive function, speech perception, quality of life, physical activity, loneliness, mood, and medical health. Wearing hearing aids was associated with clinically significant improvement in mental agility. They also saw an increase in speech perception, self-reported listening disability, and quality of life. This study has important implications for dementia care.

Sarant, J., Harris, D., Bubsy, P., Maruff, P., Schembri, A., Lemke, U., Launer, S. (2020). The effect of hearing aid use on cognition in older adults: Can we delay decline or even improve cognition function? Journal of Clinical Medicine, 9(1), 254. https://doi.org/10.3390/jcm9010254

Chemically Preventing the Effects of Loud Noise

When exposed to noisy listening environments, the area where cochlear hair cells meet the auditory nerve can be damaged. What if there were a way to prevent that from happening? Researchers at the University of Iowa and Washington University, St. Louis, injected a drug into mice that prevented this kind of damage without compromising the quality of the sound. Although this drug is only in its early stages of testing, it could change the lives of individuals who deal with noise exposure in their daily lives.

Hu, N., Rutherford, M. A., Green, S. H. (2020). Protection of cochlear synapses from noise-induced excitotoxic trauma by blockade of Ca2+ – permeable AMPA receptors. Proceedings of the National Academy of Sciences, 117(7), 3828-3838. https://doi.org/10.1073/pnas.1914247117

White Noise Could Improve Hearing

Prof. Dr. Tania Rinaldi Barkat and her team at the University of Basel studied auditory perception and sound discrimination, with a specific focus on distinguishing between sounds of the same frequency in challenging sound environments. They found that when there is white noise in the background, participants were more successful in discriminating between subtle differences in tone as compared to quiet environments.

Christensen, R. K., Lindén H., Nakamura M., Barkat, T.R., (2019). White noise background improves tone discrimination by suppressing cortical tuning curves. Cell Reports, 29(7), 2041-2053. https://doi.org/10.1016/j.celrep.2019.10.049

RESEARCH SPOTLIGHT:

BENEFITS OF COCHLEAR IMPLANTATION FOR SINGLE-SIDED DEAFNESS

Losing hearing in one ear can be more debilitating than many people imagine.

Single-sided deafness can significantly reduce sound localization, creating confusion as to where a sound is coming from. People with single-sided deafness also have greater difficulty understanding speech, especially when someone speaks on their deaf side. Many people with single-sided deafness also experience severe tinnitus. There is also the sense of “not being whole” when listening with only one ear. All of these difficulties can add up to a reduced quality of life, greater difficulty in communication, and increased isolation, despite having one perfectly functioning ear.

Studies in Europe over the last ten years have shown that cochlear implants can restore hearing in the deaf ear for patients with single-sided deafness. These studies also showed improved localization, better speech understanding, significantly reduced tinnitus severity, and improved quality of life. While cochlear implants were approved for patients with single-sided deafness in Europe (primarily to reduce tinnitus), they were not indicated for patients in the USA. However, in collaboration with researchers at USC and UCLA, the House Institute recently participated in an FDA clinical trial to evaluate the safety and efficacy of cochlear implants for patients with single-sided deafness in the USA.

Patients with single-sided deafness were implanted with a MED-EL cochlear implant device by Eric Wilkinson, MD, of the House Ear Clinic. These patients were evaluated before implantation, and again at one, three, and six months after implantation. After six months of cochlear implant use, substantial improvements were observed for localization, speech understanding, and quality of life. Tinnitus severity was greatly reduced when the cochlear implant was turned on. Much work still remains to balance the electric hearing of the cochlear implant with the acoustic hearing in the other ear. John Galvin, PhD, in collaboration with Eric Wilkinson, MD, Dawna Mills, AuD, Jordan Rock, AuD, and Qian-jie Fu, PhD, are currently researching how to best make acoustic and electric hearing work together. Your continued funding of HIF allows researchers to continue this important work. Give online at www.hei.org/donate

Galvin, J. J., Fu, Q. J., Wilkinson, E. P., Mills, D., Hagan, S. C., Lupo, J. E., Padilla, M., & Shannon, R. V. (2019). Benefits of cochlear implantation for single-sided deafness: Data from the House Clinic-University of Southern California-University of California, Los Angeles Clinical Trial. Ear Hear, 40(4): 766-781. https://doi.org/10.1097/AUD.0000000000000671.

2020 PUBLICATION LIST

Barnard, Z. R., Lekovic, G. P., Wilkinson, E. P., & Peng, K. A. (2019). Vestibular nerve section via retrolabyrinthine craniotomy. Operative Techniques in Otolaryngology. 30(3), 212-216. https://doi.org/10.1016/j.otot.2019.07.005

Boyd, C., Shew, M., Penn, J., Muelleman, T., Lin, J., Staecker, H., & Wichova, H. (2020). Postoperative opioid use and pain management following otologic and neurotologic surgery. Annals of Otology, Rhinology & Laryngology, 129(2), 175-180. https://doi.org/ 10.1177/0003489419883296

Maxwell, A. K., Mehta, G. U., Muelleman, T., Bernard, Z. R., Hartwick, T., Mark A., Brackmann, D. E., & Lekovic, G.P. (2020). Hypofractionated robotic stereotactic radiosurgery for vagal paragangliomas: A novel treatment strategy for cranial nerve preservation. Otolaryngology Head & Neck Surgery. Epub ahead of print. https://doi.org/10.1177/0194599820910150

Maxwell, A. K., Muelleman, T., & Brackmann, D. E. (2020). Congenital cholesteatoma of sphenoid, occipital, and temporal bones: 54 year follow up. Otology & Neurotology. Epub ahead of print. https:/doi.org/ 10.1097/MAO.0000000000002601

Maxwell, A. K., Slattery, W. H., Gopen, Q. S., & Miller, M. E. (2020). Failure to close the gap: Concomitant superior canal dehiscence in otosclerosis patients. Laryngoscope, 130(4), 1023-1027. https://doi.org/10.1002/lary.28167

Mehta, G. U., Huynh, H., & Lekovic, G. P. (2020). Peripheral nerve sheath tumors in neurofibromatosis type 2: Surgical and histopathologic features. Clinical Neurology and Neurosurgery, 190. https://doi.org/10.1016/j.clineuro.2019.105649

Mehta, G. U., Muelleman, T. J., Brackmann, D. E., & Gidley, P. W. (2020). Temporal bone resection for lateral skull-base malignancies. Journal of Neurooncology. Epub ahead of print. https://doi.org/10.1007/s11060-020-03445-4

Muelleman, T. J., Pippin, K., Shew, M., Villwock, M., Lin, J., Quesnel, A. M., Ledbetter, L., & Staecker, H. (2020)The size of internal auditory canal diverticula is unrelated to degree of hearing loss. Laryngoscope, 130(4), 1011-1015. https://doi.org/10.1002/lary.28155

Pandrangi, V. C., Han, A. Y., Alonso, J. E., Peng, K. A., & St John, M. A. (2020) An Update on epidemiology and management trends of vestibular schwannomas. Otology & Neurotology, 41(3):411-417. https://doi.org/10.1097/MAO.0000000000002542

Sennaroğlu, L., Yaralı, M., Sennaroğlu, G., Çınar, B. Ç., Batuk, M. Ö., Yücel, E., Bilginer, B., Bajin, M. D., Winter, M., & Wilkinson, E. P. (2020). Simultaneous Cochlear and auditory brainstem implantation in children with severe inner ear malformations: Initial surgical and audiological results Otology & Neurotology. Epub ahead of print. https://doi.org/10.1097/MAO.0000000000002595

Vermiglio, A. J., Soli, S. D., Freed, D. J., & Fang, X. (2020). The effect of stimulus audibility on the relationship between pure-tone average and speech recognition in noise ability. Journal of the American Academy of Audiology, 31(3), 224-232. https://doi.org/10.3766/jaaa.19031

One of the House Institute's greatest research accomplishments was the development of the first cochlear implant for clinical trial by William House, MD, DDS, and Engineer Jack Urban. **This is William House's story.**

William House, MD, with Tracy, the first pediatric cochlear implant recipient under 5 years old.

The Origins of the **Cochlear Implant**

Electrical stimulation of the ear dates back to the early 1800s when Physicist Alesandro Volta inserted an electrode in his ear and noted the sensation of sound. It would be nearly a century and a half later before doctors first developed a trial for an actual patient study. In 1957, Charles Eyries, MD, an ear, nose, and throat physician, along with Neurophysiologist Andre' Dijuourno, implanted an electrode into the ear of a volunteer suffering from severe, destructive ear disease. Once inserted, the patient reported hearing what sounded like soup boiling. This news inspired William House, funded by the House Institute, to begin his research into a cochlear implant to restore hearing in deaf patients.

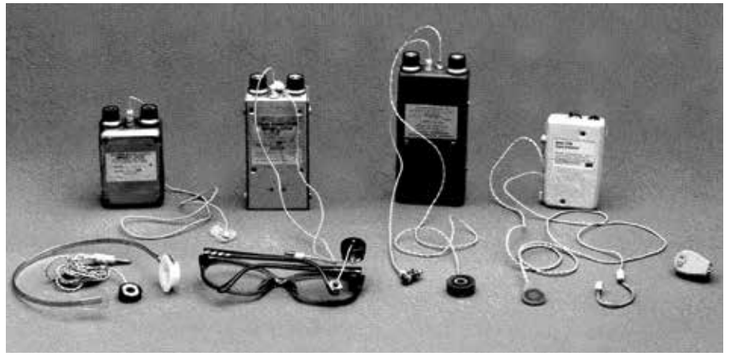
In 1960, House partnered with James Doyle, an engineer, to implant three patients with a gold electrode. The patients were able to hear sounds but all of them developed subsequent infections, necessitating removal of the implants.

William House, MD (left), Howard House, MD (right), and John House, MD (middle) with a pediatric cochlear implant recipient.

Because of William House's pioneering work, the persistence of a dedicated staff and the support of the House Institute, millions of people around the world can now hear with the aid of cochlear implants.

Working with Engineer Jack Urban, Dr. House then implanted three patients with a newly designed, single-electrode device. All three patients were able to hear environmental sounds, and their ability to understand speech improved. Dr. House and Jack Urban worked many nights with these patients, who would come to Urban's engineering office to work with House and Urban on perfecting the quality of sound, on their understanding of speech, and to make adjustments to the implants. In 1972, a wearable implant was developed at the House Institute that allowed patients to take their implants home.

In 1974, the first international meeting on electrical stimulation of hearing convened in San Francisco. Dr. House presented a motion picture demonstrating the history and results of some of his implanted patients. He also brought some of his patients with him to have them tell their stories. Surprisingly, there was considerable resistance to and criticism of the cochlear implant. Despite this resistance, he continued his pioneering work.



Previous designs of the cochlear implant.

CONTINUED ON PAGE 12

Eventually, the single electrode implant was approved by the FDA for adults in 1984. In 1987, a multiple electrode implant was approved for adults; and finally, in 1990, this was approved for implantation in children.

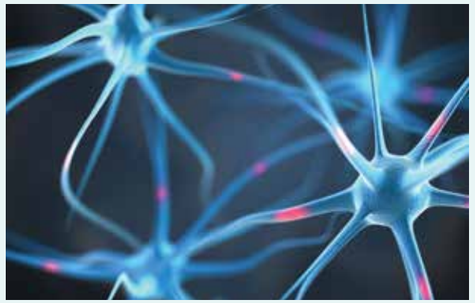
Because of William House's pioneering work, the persistence of dedicated staff, and the support of the House Institute, millions of people worldwide can now hear with the aid of cochlear implants.

Quite literally, the House Institute finds its foundation deeply rooted in the spirit and work of Dr. William House and his team. Their prowess for innovation, tenacity, and tireless efforts toward the mission "that all may hear" informs our every step forward.

Engineer Jack Urban (right) with cochlear implant recipient Charles Graser, one of the first cochlear implant recipients.

To help us continue critical cochlear implant research visit **www.HEI.org/donate**

IN-HOUSE TREATMENTS & INNOVATIONS



Intraoperative Fluorescence

Intraoperative fluorescence has been studied in various surgical fields to gain a better view of important structures, such as blood vessels and tumors. The House Institute Foundation's research team used an injectable compound to enhance the identification of the tumor-nerve interface in patients undergoing vestibular schwannoma (acoustic neuroma) surgery. This technique uses light in near-infrared wavelengths to induce fluorescence of vestibular schwannomas and surrounding nerves, such as the facial nerve and the cochlear nerve. This enables surgeons to perform more accurate dissection of tumor tissue while preserving essential structures.

Future avenues of investigation include using the technology in other neurosurgical and neurotological procedures. Ultimately, this technique shows promise in improving facial nerve and hearing outcomes in vestibular schwannoma surgery.

Tinnitus Drug Trial

The House Institute participated in an industry-sponsored trial for an experimental medication that treats severe tinnitus, or ringing in the ears. The trial required that we recruit patients with severe tinnitus in one ear that had been present no longer than six months.

The medication was injected through the eardrum (tympanic membrane), then absorbed into the inner ear. This was a double-blinded, placebo-controlled study, meaning neither the patient nor the doctor knew if they were getting the real medication or a placebo. The goal of this trial was to better understand how effective this treatment could be in alleviating tinnitus for patients. Data from this study is still being collected and analyzed.

TEMPORAL BONE ANATOMY AND FUNCTION

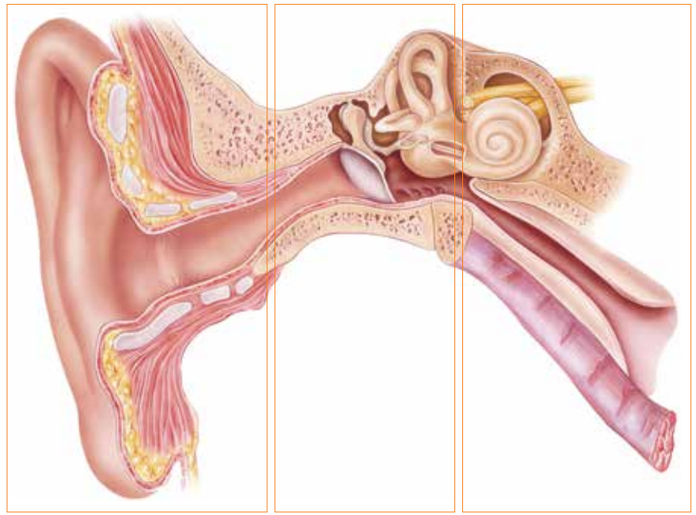


Figure 1

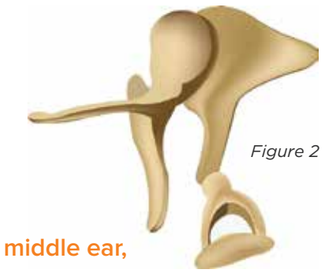


Figure 2

The temporal bone is divided functionally into the outer ear, middle ear, and inner ear. *(Figure 1)*. As sound enters the ear, it travels through the external auditory canal, vibrates the tympanic membrane and middle ear bones (also called ossicles) *(Figure 2)*, and then is translated into a neural impulse by the inner ear. As we tour the temporal bone, we will follow the course of received sound and discover which otologic and neurotologic disorders can disrupt the process of hearing.

Figure 3

Figure 4

Outer Ear

The external auditory canal (EAC) is about 2.5 cm long and is made of bone (2/3) and cartilage (1/3). Common causes of EAC obstruction are cerumen (ear wax), infection (also called otitis externa or swimmer's ear), foreign bodies, and growths. Cerumen is produced by modified sweat glands in the EAC and serves as a protective function against infection. One of the most common disorders of the EAC in Southern California is bony growths caused by cold water and evaporation in the ear canal—also called exostoses or surfer's ear (Figure 3).

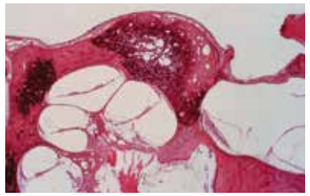


Figure 5

Figure 6

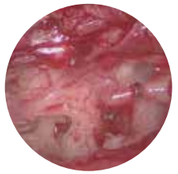


Figure 7

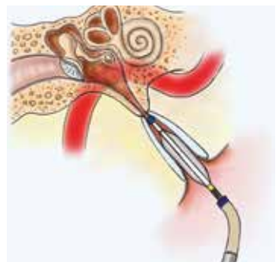


Figure 8

Middle Ear

The middle ear extends from the tympanic membrane (TM) through an air-filled space to the oval and round windows into the inner ear. The TM (Figure 4) can be disrupted by infection (or Q-tips) and may require tympanoplasty (surgical repair). The old adage that nothing smaller than your elbow should go in your ear is true!

The middle ear space contains the ossicles (middle ear bones), which have a transformer mechanism that amplifies sound 22:1. Sometimes these bones are affected by infection or ingrowth of skin (cholesteatoma) and may need to be replaced. The stapes, which is the smallest bone in the body, is often replaced in patients with otosclerosis, a temporal bone disorder that causes the stapes to become fixed and stop vibrating (Figures 5-7).

The Eustachian tube (ET) equalizes the pressure of the middle ear space by its communication with the back of the nasal cavity (nasopharynx). When the ET does not open and close well, patients can have ear pressure, middle ear fluid, and problems with the eardrum. Eustachian balloon tuboplasty is a relatively new surgical procedure that dilates the ET to improve its function (Figure 8).

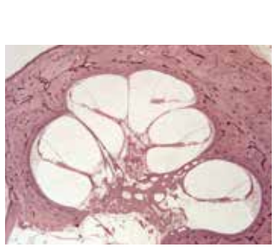


Figure 9 - Normal Anatomy

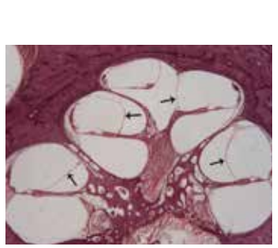


Figure 9 - Meniere's Disease

Inner Ear

As the base (or footplate) of the stapes vibrates, it causes a movement of fluid inside of the cochlea. Shearing forces between the tips of inner hair cells and a membrane in the Organ of Corti translate this energy into a neural impulse, which travels along the cochlear nerve to ultimately reach the hearing centers in the brain. In addition to the cochlea, the inner ear consists of the balance organs (semicircular canals, utricle, and saccule). One disease process that can affect all parts of the inner ear is Meniere's Disease. This disorder causes hearing loss, tinnitus, ear fullness, and vertigo and is associated with extra fluid inside the cochlea (or endolymphatic hydrops) (Figure 9).

Figure 10

When nerve hearing is lost, hearing aids can amplify sound to help patients hear better, but hearing aids are not effective for severe to profound hearing loss. The cochlear implant, first developed at the House Clinic, is an implantable device that can restore hearing to these patients (Figure 10). This remarkable technology filters the incoming sound into frequency bands and directly stimulates the cochlear nerve through an electrode placed inside of the cochlea.

The hearing and balance nerve (or cochlear and vestibular nerves) can also be affected by a benign growth called a vestibular schwannoma (also known as VS or acoustic neuroma). These tumors usually grow slowly and can affect hearing and balance. The House Clinic revolutionized microsurgical treatment for VS and is at the cutting edge of VS research and treatment today.

A Look into Our Temporal Bone Lab

BY DR. HOSSEIN MAHBOUBI, MD, MPH

For decades, our fellowship program at the House Institute aims to educate neurotologists in surgical techniques of the temporal bone. Current fellow Hossein Mahboubi, MD, MPH, details the importance of his time spent in the bone lab.

The ear canal, eardrum, hearing bones, and inner ear containing the hearing and balance organs are all located within one of the bones that forms the skull and skull base named the temporal bone. Almost all of the surgeries involving the diseases of the ear and lateral skull base include removing parts of this bone to access various structures of the middle or inner ear. A pathway through this bone can also be created to reach the brainstem and cranial nerves to remove tumors such as meningiomas and vestibular schwannomas (also known as acoustic neuromas). Additionally, cranial nerves and vessels that take blood to and from the brain traverse within the bone or adjacent to it. These structures pass through two inches of space, some of them being within millimeters of each other. As such, ear and skull base operations are very delicate. The surgeon needs to be precise to remove any tumors without damaging the surrounding structures. A temporal bone lab is where ear surgeons practice these surgical techniques and drilling methods on cadaveric temporal bones that have been donated.

"Working in this lab has been a great experience, and we hope that it continues to serve the current and future fellows for many years to come." - DR. HOSSEIN MAHBOUBI, MD, MPH

For fellows training to subspecialize in care and surgeries of the ear and skull base (formally called Neurotology and Skull Base Surgery), having a temporal bone lab is invaluable. The House Institute fellows have been fortunate to be able to practice and fine-tune their techniques in our temporal bone labs throughout our fellowship and prior to major surgeries. Our temporal bone lab has two working stations where the fellows can use the donated temporal bones during their dedicated educational time. The stations include operative microscopes, high-speed drilling machines, suction/irrigation machines, and standard otologic instruments. Once the bones are drilled, they are returned according to standard procedure, and new bones are provided for the following sessions. Working in this lab has been a great experience, and we hope that it continues to serve the current and future fellows for many years to come.

ABOUT DR. HOSSEIN MAHBOUBI, MD, MPH

Hossein Mahboubi, MD, MPH, joined the House Institute Foundation as a clinical fellow in July 2019, where he is training to subspecialize in neurotology and skull base surgery. Prior to this, he completed his residency training in Otolaryngology (Head and Neck Surgery) at University of California, Irvine, in June 2019. Hossein was born and raised in a small town in Northern Iran by the Caspian Sea. Growing up in a family that valued education above all, he became fascinated with medicine and science. He worked diligently to get into the country's top medical school, Tehran University of Medical Sciences. During medical school, he became interested in ear, nose, and throat surgery and decided to move to the U.S. to pursue his career at the frontiers of science. Hossein started a postdoctoral research fellowship at University of California, Irvine, where he did extensive research on the diseases of hearing and vestibular systems. This was followed by residency training at the same institution. Hossein has published several articles and book chapters, and presented his work at national meetings. His accomplishments include multiple institutional and national awards, as well as two prestigious resident research grants from the American Academy of Otolaryngology - Head and Neck Surgery.

IN MEMORIAM
Fred H. Linthicum, Jr.

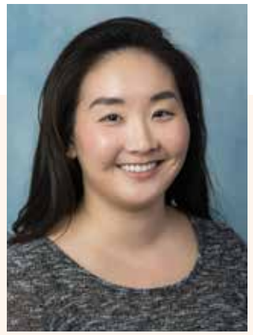
In January 2020, Frederick Hamilton Linthicum, Jr. passed away peacefully in his home surrounded by family. He will always be remembered for his contributions to otology and neurotology here at House.

Dr. Fredrick H. Linthicum, Jr., MD, was born and raised in Los Angeles, CA. He completed his undergraduate studies at Pomona College and graduated from the University of Southern California School of Medicine. While completing his medical internship, he was involved in a motorcycle accident that broke his hand. He asked a student nurse, Jean Wolverton, to write up his histories and physicals since he could not do so himself. That simple request led to a happy marriage of more than 70 years.

In 1958, he joined Howard House, William House, and James Sheehy in founding the Otologic Medical Group (now House Ear Clinic), where he worked two days a week in the Eccles Temporal Bone Lab with George Keleman, MD. Years later, when Keleman passed, Fred decided to retire from active practice to spend all of his time in the Eccles Temporal Bone Laboratory. During this time, he was a mentor to many associates and students from around the world. Dr. Linthicum published more than 240 papers, many of which were with his fellows and students. He was a dedicated teacher and was always more than willing to help his students.

Frederick Linthicum was a good friend to many, a fantastic scientist, and above all, a great teacher. He will be remembered forever for his significant contributions to the histopathology of Otology and Neurotology. His loving wife, Jean, and daughter predeceased him. He is survived by sons Fred and Philip, their wives, and five grandchildren.

Changing the World, One Hearing Aid at a Time



When Audiologist Dr. Soo Jang is not providing diagnostics and treatments for patients in her clinical practice, she partners with the House Institute Foundation to increase access to hearing care in high-need communities worldwide.

Soo Jang joined the House Institute in 2018 after graduating with her Doctorate in Audiology from Washington University School of Medicine in St. Louis, Missouri. After completing her clinical externship at Swedish Medical Center in Seattle, Dr. Jang moved back to her hometown to provide care to those with hearing difficulties in Los Angeles. Dr. Jang provides services in diagnostic methods and evidence-based treatment methods in audiology, with an emphasis on hearing aid care.

Audiologists like Dr. Jang specialize in the prevention, identification, and evidence-based treatment of hearing and balance disorders for all ages. Her goal is to minimize the negative impact of these disorders, with the hope of achieving improved outcomes and quality of life. According to the World Health Organization (WHO), approximately 6% of the world's population – 466 million people – have hearing loss that is disabling to their everyday lives. Of that 466 million, only 17% of those who can benefit from hearing aids actually use them. This is mainly due to financial limitations, limited access to resources, or denial of hearing loss. Unaddressed hearing loss can have social, functional, emotional, and economic impacts on individuals' lives.

In 2019, Dr. Jang joined the House Institute Foundation's (HIF) Global Hearing Health Committee. "I found HIF's commitment to universal hearing healthcare very appealing. The Global Health Committee's mission aligns with my professional vision and belief in the importance of addressing hearing loss and its implications globally," Jang explained. By fostering collaborative humanitarian efforts within the fields of otology and audiology, Dr. Jang and the Global Health Committee are working to provide patients with necessary interventions, and to educate medical professionals overseas who may benefit from the standardized practices implemented in the United States. Through future HIF partnerships, Dr. Jang hopes to work jointly with otologists, audiologists, and technicians abroad to translate any finalized training material to their language of interest. This may help educate hearing professionals in numerous developing countries, which in turn may alleviate patients' limited access to care. Dr. Jang is also currently working with several manufacturers to receive equipment and hearing aid donations for international mission trips. These indispensable contributions will increase patient access to care and help bring medical relief to those who need assistance.

Unaddressed hearing loss can have social, functional, emotional, and economic impacts on individuals' lives.

Today, with support from the House Institute, Dr. Jang continues to advocate for patient success, and helps educate the general public on the implications of hearing loss and benefits of treatment, with the long-term vision of increasing patient access to resources and care worldwide.

Incorporating neurotology fellows in our humanitarian efforts continues to be an important part of our global health and educational missions.

Global Outreach in Physicians-in-Training

Physicians develop strong humanitarian ideals through personal experience, often in collaboration with a medical team. Acquisition of lifelong appreciation and devotion to humanitarian work can be nurtured through various means. While the opportunity must first be available, future humanitarian efforts depend on physicians having a successful and rewarding experience.

Adam Master, MD, performing chronic ear surgery in Nepal with Ear Aid Nepal in 2018.

In the House Institute's Otology-Neurotology Fellowship Program, the second-year Neurotology fellows are offered a supervised humanitarian educational experience in a sustainable global otology program. The timing and nature of this program fosters altruism at an early point in their careers.

Fellows also grow in their medical professionalism, which is one of the Core Competencies the Accreditation Council for Graduate Medical Education (ACGME) uses in structuring medical education goals.

Dr. Eric Wilkinson and current fellow Dr. Anne Maxwell recently reviewed this humanitarian otology elective program and surveyed prior participants. Benefits, challenges, and barriers to participation were assessed. The results of this study were presented at the Triological Society/Combined Otolaryngology Spring Meetings (COSM) Virtual Poster Session in May and will be published later this year. All interested are encouraged to keep an eye out for the results of this study.

An otologic and audiologic outreach program to El Salvador that focused on otosclerosis and hearing loss had been planned for this spring. Through this global health effort and the dedicated efforts of Dr. Soo Jang, an audiologist with the House Ear Clinic, many donations of hearing aids were secured for distribution. Unfortunately, due to the COVID-19 global pandemic, international travel was halted, and this outreach program was postponed. However, humanitarian outreach remains an integral part of the mission of the House Institute. The House Institute Foundation expects to resume its efforts in partnership with our global communities in the future.

Kathryn Noonan, MD, performs chronic ear surgery in Nicaragua in 2019.

To help us continue our global humanitarian efforts visit **www.HEI.org/donate**

HEARING IMPAIRMENT & SOCIAL DISTANCING

It was mid-March. We were nearing spring break, March Madness, festival season, and Easter, when suddenly, the world went quiet. Streets, highways, public transportation, and airports all emptied as millions of people followed safer-at-home orders from their governors. The coronavirus pandemic disrupted life in the United States in a way many thought impossible. A country built on a constantly bustling economy came to a grinding halt, along with the rest of the world. It was a difficult time for everyone from medical professionals providing care to frontline employees cleaning public places, delivering food, and taking care of critical infrastructure. Though many readily hunkered down at home for their own safety and that of the most vulnerable in their communities, social distancing proved difficult for certain groups of people, especially those with hearing loss.

Real-world activity is multisensory. Visual and auditory cues, such as lip reading and listening, work together to aid comprehension in the deaf and hard of hearing. But, as everyone donned masks, this kind of sensory collaboration became impossible.

Exacerbating this was the fact that conversations often happened over a six-foot distance in public venues. How is a deaf or hard of hearing individual to adequately participate in situations such as these?

Many were still mastering the face-to-face communication of ordinary life, but when that simple option became unavailable, they had to figure out ways to adapt. Life went digital. Technological innovations provided ways to stay connected in bleak times.

Epidemiologists have not ruled out the possibility of COVID-19 or other viruses disrupting life in this way in the future. The House Institute Foundation has provided a list of tech tools that could help make the next bout of social distancing a little easier.

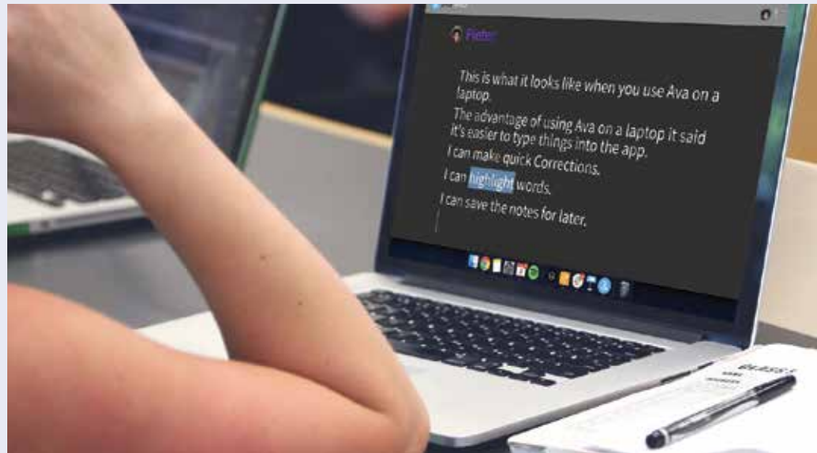
TECH TOOLS

Speech-to-text apps like AVA and Otter.ai can provide transcriptions of in-person conversations.

Text-based relay services are an accessibility option for iOS and many Android operating systems. This allows you to see real-time transcriptions of all phone calls.

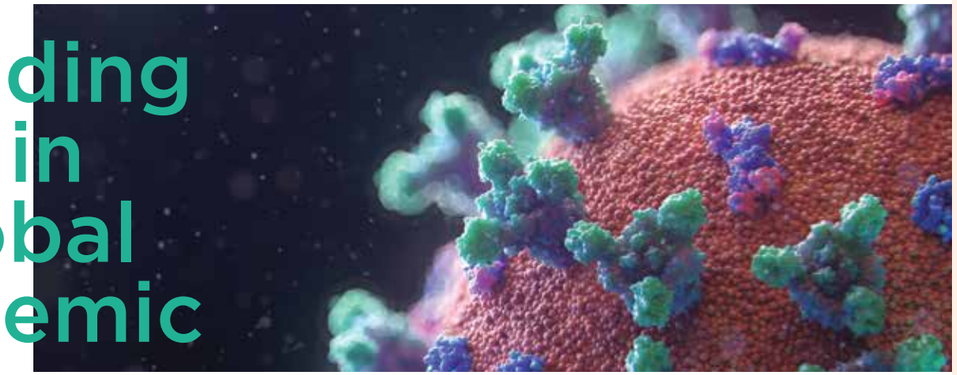
Video relay services apps like Convo and Purple can provide American Sign Language translations for phone calls.

Captioned telephones like CaptionCall and ClearOptions can provide real-time transcriptions in easy-to-read fonts.



The COVID-19 pandemic has brought with it numerous changes. As hearing health professionals who work in close proximity to our patients, we immediately began wearing face masks not just to protect ourselves, but our patients as well.

Providing Care in a Global Pandemic



BY KEVIN PENG, MD AND JENNIFER DEREBERY, MD

With most of our clientele being deaf or hard of hearing, even those with mild hearing loss depend, largely subconsciously, on lipreading for comprehension. Social distancing measures only compound the problem, as they place speakers and listeners at a greater physical distance than most of us are accustomed to. With these measures in place, medical office visits present real challenges for individuals with a hearing impairment.

We found the best option was to turn to telehealth, where physicians and online providers may remove masks during an online video conversation. We also tried to source masks with a transparent, impermeable (usually plastic) cover over the lips and mouth. These were very difficult to find, but certain members of our office staff were able to source a small quantity from online vendors. Individuals with hearing impairment may consider obtaining a supply to give to close friends, family, or caregivers who they may need to communicate with on a frequent basis.

While we agree with the CDC recommendation to postpone all non-essential visits, we realize that for the deaf or hard of hearing, there are unique health and communication issues that really cannot wait to be addressed. The physicians of the House Institute are still available, and will be throughout the pandemic, to see patients both in person as well as via telehealth. Perhaps more than any other recent public health event, this pandemic—with the CDC's recommendation for universal face coverings—has reemphasized the need for the detection and treatment of hearing loss.

None of us know when the need for social distancing and masking is going to lessen, but we can realistically expect it is going to last for some time. Various experts have predicted an increase in cases in the fall, even if we are lucky enough to "flatten the curve" on a national scale. We remain optimistic, though, that modern medicine and science will allow us to overcome this virus in due time.

AVA-Subtitles to Real-Life Conversations

The House Institute's Neurofibromatosis Type 2 (NF2) patient Roselle Dyan Rico has bilateral hearing loss. But this does not stop the 26-year-old UC Riverside Biology student from participating in conversations. She uses the app AVA to increase the efficiency of her day-to-day communications.

What is AVA?
Roselle Dyan Rico: It is an accessibility app for the deaf and hard of hearing that provides real-time captions for the user.

How did you hear about the app?
Rico: I am a member of the NF2 Crew group page on Facebook. Many people with NF2 and their family members use the platform to share insights about their experiences with the disease. I saw a post from another member asking about how others communicate after losing their hearing, and someone suggested the AVA app.

In what areas of your life do you use AVA?
Rico: I use it mainly for my doctor's appointments. I also use it during class discussions.

How has it affected your day-to-day communications?
Rico: I have gained some independence when it comes to talking to other people. After I became deaf, I became unusually quiet, and speaking with the other students became a struggle. I learned American Sign Language to help me communicate, but I also wanted the option of knowing what exactly was being said to me or the terms that were used in class discussions. I use it whenever I order food or coffee in school. For my doctor's appointments, I used to rely on my mother to relay everything the doctor said. But with AVA, I can freely join the conversation without worrying if I have missed important information.

Would you recommend that other patients use it? If yes, why?
Rico: Yes, I will recommend it to other patients. It may seem tedious at first, holding up your phone while "listening in", but I eventually got used to it. It made me feel more confident in expressing myself. There are certain issues to be wary of, such as connectivity issues. The transcribing accuracy decreases with a slow internet connection. I found that the speaker's accent can be a a factor too. But overall, AVA has been a life-changer, and I hope many patients will have the chance to use it.

To help us continue to educate the deaf and hard-of-hearing community, visit **www.HEI.org/donate**

Mary B. Leutloff: Pioneer and Philanthropist

LEGACY OF A LIFE WELL-LIVED

12/8/1921 – 8/21/2019

Driven to discover and develop her breadth of talents, Mary B. Leutloff is remembered as a well-loved and remarkable woman who was devoted to her family and the causes she cared about. Self-made in an era where few women deviated from the pressures of traditional gender roles, Mary was determined to rise from her humble beginnings, achieve success, serve others, and spread joy.

Mary's strong will and resilience were evident from a young age. As a child growing up on a Dutch farm in Pennsylvania, she displayed minimal interest in milking the cows or tending to the fields, and quickly set her sights beyond the gates of the rural farmyard. While many fellow students left the one-room schoolhouse after eighth grade, concluding their formal education, Mary not only completed high school but continued on to pursue nursing studies, graduating at the top of her class.

She embarked on a fulfilling career, becoming an operating room nursing supervisor in hospitals in New York City and Texas. In 1950, she was commissioned as a first lieutenant in the United States Air Force, bypassing the requisite military basic training in recognition of her extensive nursing experience. She initially served as a base hospital nurse, then quickly became a flight nurse, caring for wounded soldiers during medical evacuations from battlefields in Korea, Japan, Guam, Wake, and Hawaii. Mary's dedicated service was not without toll; she suffered hearing loss due to the frequency of her flights. Upon receiving corrective surgery from Howard P. House, MD, she was able to hear unassisted until her seventies, when she began using hearing aids. In 1954, she was honorably discharged from the Air Force and married her husband, Wayne E. Leutloff. Wayne's career as an aeronautical engineer took them through many states before they ultimately settled happily in Santa Maria, California.

Her spirit lives on through her generosity.

While Mary's unstoppable and, at times, even obstinate character enabled her to embrace challenges, perhaps of equal importance was her ability to find mirth in the smallest of things. Her sense of humor was known to adopt an artfully mischievous air. Her family recalls one such instance where she completed her take-home geology exam in French, requiring the instructor to have the answers translated before grading the test.

Mary embodied an ethos of lifelong learning and intellectual curiosity, enthusiastically exploring her love for music, languages, and literature. An avid pianist and vocalist from childhood, Mary sang in an industrial choir and performed at weddings. She continued taking courses that piqued her interest throughout adulthood and earned an Associate of Arts degree in Language Arts in 1976. She became an ardent ambassador of the arts and supporter of local organizations such as the Santa Maria Philharmonic Society.

Poet and Novelist Ocean Vuong contemplated what it means to "live a life worthy of your breaths." Perhaps we should observe the example of individuals such as Mary Leutloff, whose 97 years of life were shaped by beauty, bravery, selflessness, and passion. Her spirit lives on through her generosity. Her gifts invigorate the research, education, and humanitarian efforts at the House Institute today, as well as the many other causes to which she gave. This legacy of service and philanthropy is a banner we are honored to carry that will positively impact the lives of countless people for years to come.

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