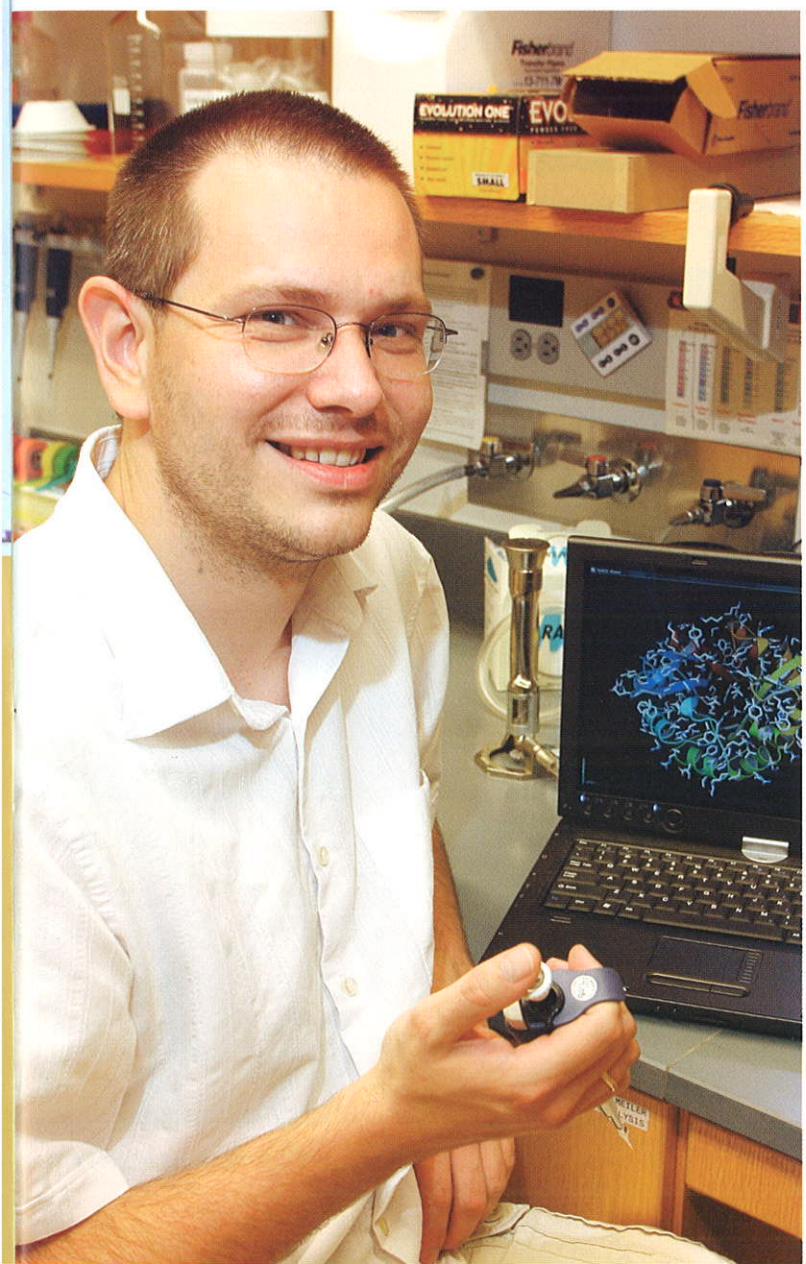
International Chemistry

SHARED REACTIONS FROM LEIPZIG TO NASHVILLE

by CARIE FORTENBERRY

Germany is a country with a rich history and a thriving culture, a leader in scientific discoveries, and a desired destination for many, including faculty and students from Vanderbilt University (VU). The bustling metropolis of Leipzig, situated in the state of Saxony in eastern Germany, offers a unique opportunity to fully experience these aspects of German life. Leipzig is a beautiful city, the home of the famous composer Johann Sebastian Bach, and the location of the 1989–1990 Monday demonstrations—the most prominent mass protests against the East German regime. At the *Auerbachs Keller*—a restaurant once frequented by Johann Wolfgang von Goethe—visitors rub the shoe of Faust's statue for good luck. Leipzig is also home to the *Völkerschlachtdenkmal*, Europe's tallest monument, which commemorates Napoleon's defeat at the Battle of the Nations.



In the midst of this rich cultural history is Leipzig University (LU). Founded in 1409, LU is the second-oldest university in Germany and among the oldest in the world. Today, the university has 14 faculties and, with over 29,000 students, it is Saxony's second-largest university. Interestingly, Vanderbilt has a connection to LU that dates to the nineteenth century: James Hampton Kirkland, the second chancellor of VU, completed his Ph.D. degree at LU in 1885.

Today LU and VU share common research interests in structural and chemical biology, chemistry, pharmacology, and biomedicine. Both institutions have invested in complementary technologies and built complementary expertise. Over the past five years, a series of faculty and student exchange visits have jump-started a number of collaborative projects that demonstrate the fertile ground for a joint program in research and education.

There are striking similarities in the development of research and education at both universities, including a strong focus in chemical biology. Specific interests include the fundamentals of membrane protein structure and their interactions with small molecules, a key research area for the development of therapeutics. The current collaboration combines cutting-edge specializations in disciplines and technologies to design research projects of high complexity and impact that neither of the two research groups could complete on their own. At the same time, a fertile arena for trainees has been created by the orthogonal approaches to scientific discovery, the interdisciplinary nature of the research, complementary technologies, and cultural experiences.

Vanderbilt's association with LU started with Jens Meiler, associate professor of chemistry and pharmacology, who graduated from Leipzig with a master's degree in chemistry in 1998. Meiler's research on computational structural and chemical biology came to the attention of Annette Beck-Sickinger, a well-established LU scientist in the field of G-Protein Coupled Receptors (GPCRs) with peptide ligands.

The fledgling collaboration officially took off in 2009 when Beck-Sickinger took a three-month sabbatical, co-sponsored by the Vanderbilt International Office (VIO) and the Department of Chemistry, at the Vanderbilt Institute for Chemical Biology (VICB) to study neuropeptide Y (NPY) GPCRs. During Beck-Sickinger's tenure at Vanderbilt, additional collaborations were initiated between LU scientists and Vsevolod Gurevich, professor, Department of Pharmacology; Heidi Hamm, the Earl W. Sutherland, Jr. Professor, Department of Pharmacology; Chuck Sanders, professor,

Far left: 2010 Leipzig summer students with Dr. Beck-Sickinger; Middle left: *Nikolaikirche* (St. Nicholas Church); Left: Jens Meiler

Department of Biochemistry; Larry Marnett, professor of biochemistry and chemistry and the Mary Geddes Stahlman Professor of Cancer Research; and Terry Lybrand, professor, Departments of Chemistry and Pharmacology, and the Center for Structural Biology.

Out of these collaborations emerged a larger vision for a long-term, sustainable collaboration between VU and LU. In June 2010, a team of VU faculty members travelled to Leipzig to explore the prospective opportunities. The first official VU/LU scientific symposium kicked off with research presentations by the visiting faculty: Meiler spoke on advances in cheminformatics, Gurevich discussed arrestin function, while Dave Weaver, research associate professor, Department of Pharmacology and director of VICB's High Throughput Screening Facility, presented the technological abilities of the screening center and chemical synthesis core. Mike Stone, chair, Department of Chemistry, Hassane Mchaourab, professor, Departments of Molecular Physiology and Biophysics, Physics, and Chemistry, and professors Sanders and Lybrand also presented their research.

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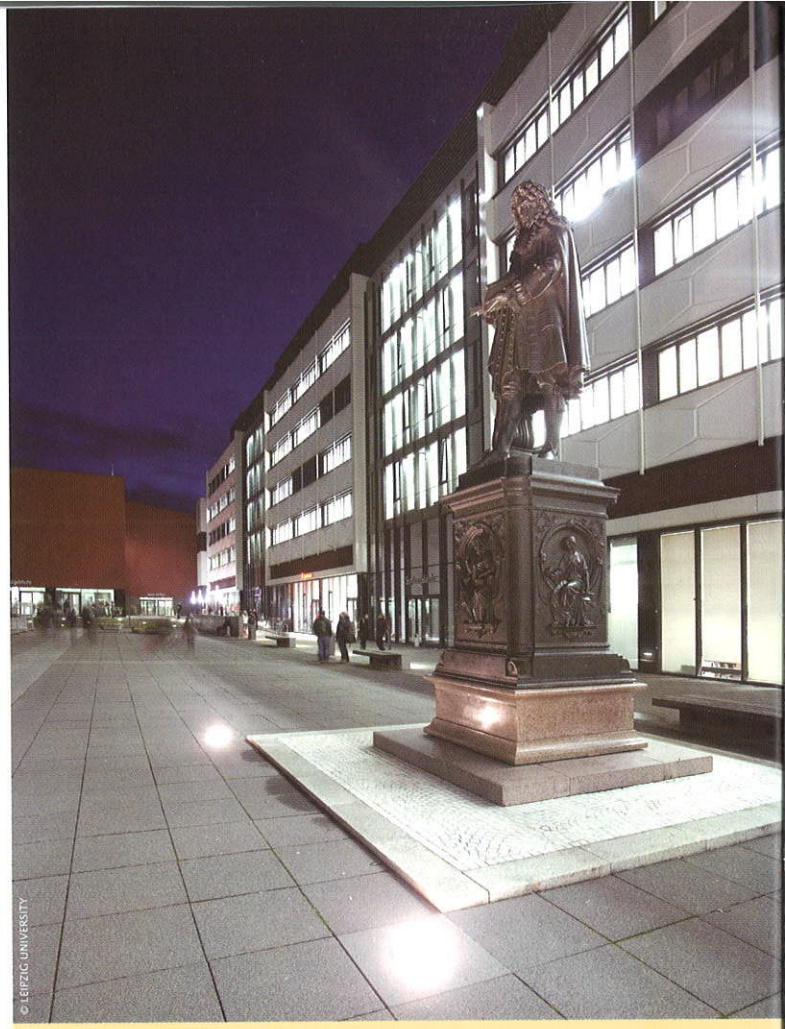
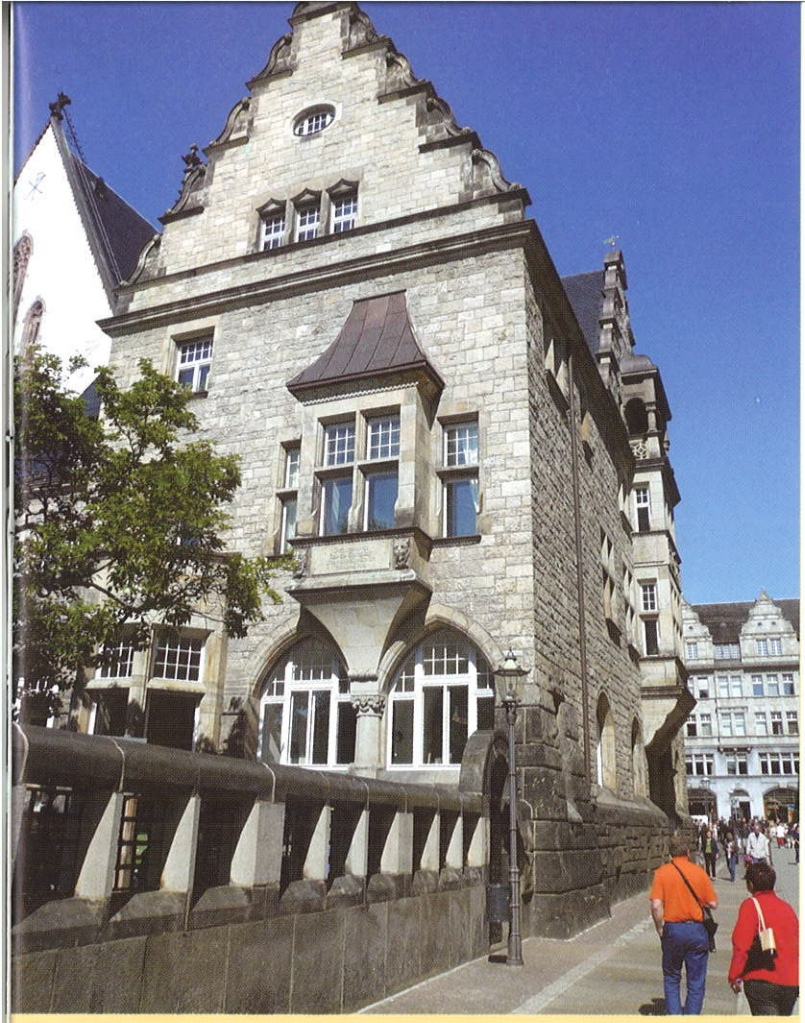
Students from both institutions also joined the ranks of the rapidly growing collaboration. Through the German Academic Exchange Service (DAAD) Research Internships in Science and Engineering (RISE) program and funds from VIO, VICB, and the College of Arts and Science, four Vanderbilt undergraduate students spent the summer of 2010 at LU. Deanna Joe ('11) and Dan Viox ('11) studied the neuropeptide Y receptor with Beck-Sickinger, while Ross Barajas ('11) worked in Dr. Daniel Huster's laboratory investigating the calcium free form of the Guanylate Cyclase-Activating Protein via NMR techniques. Aaron Coonley ('12) worked on two projects which focused on the revitalization of urban river spaces. In addition to their full-time research, the students attended lectures and traveled the beautiful European countryside. "The experiences we individually and collectively had were amazing," said Joe. "Having the opportunity to work in a research lab is a rare occurrence for undergraduates. The knowledge we gained this summer about German culture and our research is invaluable and will remain with us forever."

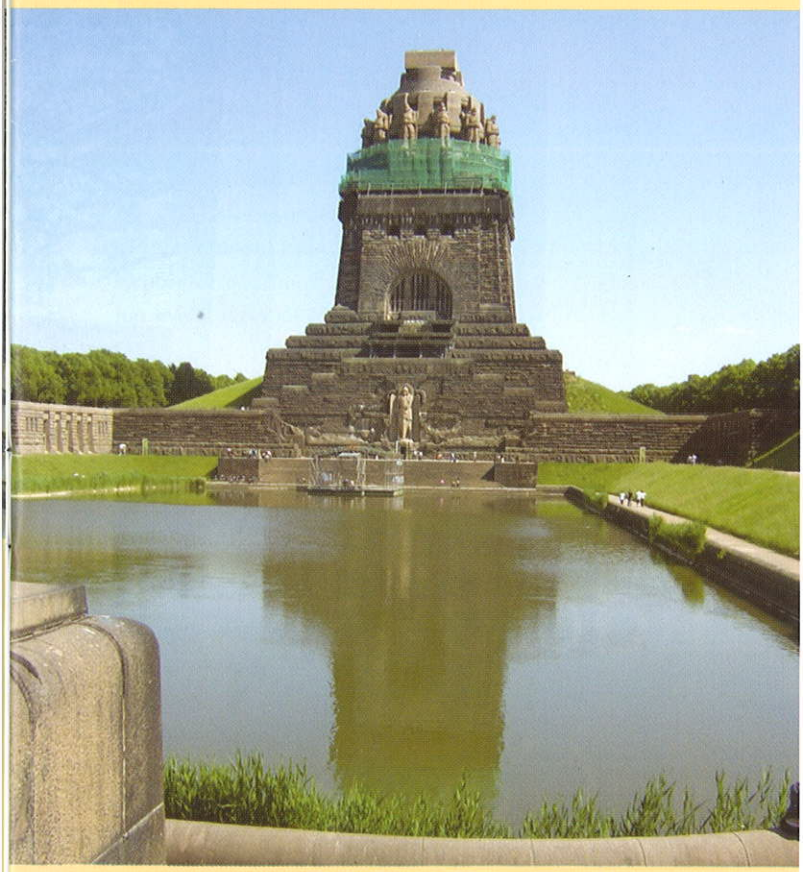


Statue of Gottfried Wilhelm Leibniz in front of Leipzig University's Seminar Building

Dr. Meiler with Leipzig visitors in 2010



Leipzig City Center



Völkerschlactdenkmal

The DAAD-RISE program also enabled four Leipzig students to come to Vanderbilt. Henrike Indrischek and Sabina Kanton spent five weeks conducting research in the biochemistry department with Mchaourab and Sanders. Two master's students, Anette Schreiber and Stefanie Nagel, spent three months at Vanderbilt; Nagel researched arrestin function with Gurevich, while Schreiber spent her time modeling a GPCR in Meiler's lab.

To maintain the forward momentum of the collaboration, eight Leipzig researchers and two members of the university's administration came to VU for a three-day symposium in November 2010. A second scientific symposium in May 2011 brought a new group of VU researchers to Leipzig to catalyze fresh research collaborations. The collaboration has seen its first two joint publications, between Drs. Hey-Hawkins of LU and Marnett of VU in the *Journal of Bioorganic Medicinal Chemistry* and between Drs. Beck-Sickinger and Gurevich in the *Journal of Biological Chemistry*.

Currently, there are more than 20 collaborative research projects underway or planned embracing the fields of structural and chemical biology, chemistry, pharmacology, and biomedicine. Graduate students from both universities are now actively working on joint international projects as part of their dissertation research. Short research stays in LU laboratories allow these students to gain hands-on experience with techniques they will then implement in their VU labs. Based on the tremendous successes the collaboration has seen to date, plans are underway to formalize future VU-LU partnerships. Meiler says, "Similar research foci and complementary expertise make Vanderbilt and Leipzig universities optimal partners in natural science research and education."

The current focus is to ensure that existing projects lead to joint publications and to explore the potential for a joint Ph.D. program. Faculty and student exchange will continue at all levels. Strong interest has been expressed in establishing collaboration in new areas, including anthropology and mathematics. To support these efforts, a proposal has been submitted to the National Science Foundation. Over the next three years the goal is to lay the groundwork for a major international center in research and education. This center would enhance the international profile of both Vanderbilt and Leipzig Universities, as this would represent the only initiative co-funded by federal agencies in Germany and the U.S.

To read more about the Vanderbilt-Leipzig partnership, visit
www.uni-leipzig.de/~vanderbilt/wordpress