Germany

http://www.arabidopsis.org/portals/masc/countries/Germany.jsp
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Research on *Arabidopsis thaliana* has a long history in Germany, and many individual research groups have used this reference plant for analysing different aspects of plant biology. Two independent programs support research on plant functional genomics in Germany, namely the *Arabidopsis* Functional Genomics Network (AFGN), supported by the German Research Foundation Deutsche Forschungsgemeinschaft (DFG), and the more crop, and therefore application oriented plant genomics research program, GABI, funded by the Federal Ministry of Education and Research (BMBF). Both programs work together in close cooperation, with intensive links at both the scientific and the contributor level.

The AFGN

The AFGN was founded in 2001 as a basic research program and is supported by the DFG. The AFGN currently funds 25 projects in Germany and has been organized in close coordination with the NSF 2010 Project, including a joint reviewing process. Together with many other research programs throughout the world both programs aim to elucidate the function of all *Arabidopsis* genes in the near future. The main activities of the ongoing research projects concentrate on the analyses of members of selected multiprotein families and cover the elucidation of their structure, activity, interaction partners, gene expression, intracellular localisation, post-translational regulation and function. In addition, the AFGN and the 2010 Project implemented the collaborative AFGN-2010 Young Researcher Exchange Program (AFGN-2010-YREP, http://www.uni-tuebingen.de/plantphys/AFGN/yrep.htm). The program provides funding for 1 to 3 month research visits of young scientists to the US and *vice versa*.

In 2006, the AFGN finished the worldwide largest and internationally cooperative *Arabidopsis* transcriptome project called AtGenExpress. The AFGN part of the project includes data sets for *Arabidopsis* development and response to its biotic and abiotic environment and for several natural accessions. This open access database provides an experimental base for many open access bioinformatics tools such as the Germany-based AtGenExpress Visualisation Tool (AVT) and MapMan. Together with colleagues from Austria and Switzerland the AFGN has initiated a yearly international conference on *Arabidopsis* functional genomics. In 2006, the 3rd meeting was hosted in Tübingen, Germany, and visited by over 200 hundred scientists from Europe, Asia and the US. In 2007, the 4th meeting will be held in Vienna, Austria.

The third funding period of the AFGN will start in the autumn of 2007. The AFGN program will continue to support basic functional genomics research in *Arabidopsis thaliana*, thereby contributing to the accelerated acquisition and utilization of new knowledge and innovative approaches in order to elucidate fundamental biological processes in higher plants. Two areas of research were identified which future support should concentrate on:
Functional Genomics of Biological Processes: The focus of the AFGN will move towards the genomic analysis of multigene networks whose members functionally interact with each other to accomplish a given biological process. Such a network may consist of members of the same or of different *Arabidopsis* multiprotein families.
Tools and Resources for Plant Functional Genomic Research: The development of novel and, especially, quantitative genome-wide tools and technologies (e.g. in cell imaging, protein modification and intracellular localisation, protein-protein interaction), and additional resources in plant functional genomics to address unmet needs (e.g. conditional expression collections of *Arabidopsis* for the characterisation genes with yet unknown function, intracellular protein localisation and protein-protein interaction databases).

AFGN-related Arabidopsis tools and resources

- AFGN: http://www.uni-tuebingen.de/plantphys/AFGN/AFGNHome2.html
- AtGenExpress: http://www.uni-tuebingen.de/plantphys/AFGN/atgenex.htm

AtGenExpress-related publications: Schmid et al. (2005) Nat. Genetics 37, 501-506; Kilian et al. (2007) Plant J., in press.
AVT: http://www.weigelworld.org/resources/microarray/AtGenExpress/

- MapMan: http://gabi.rzpd.de/projects/MapMan/
- 4th Tri-National *Arabidopsis* Meeting, Vienna, Austria, 2007: http://www.gmi.oeaw.ac.at/tnam2007/
- AFGN-2010-YREP: http://www.uni-tuebingen.de/plantphys/AFGN/yrep.htm

GABI programs

GABI, a BMBF funded German plant genome research program is now in its seventh year. With an annual budget of 10 million Euros plus an additional 20% from industrial partners GABI is the biggest research program in plant genomics in Germany. Approximately 30% of the total budget supports research on *A. thaliana*. In its second program period translational research was introduced: topic-oriented research clusters combine basic research on *A. thaliana* with research activities on crops. Since the start of GABI, *A. thaliana* has also served to deepen international cooperation through bilateral as well as trilateral research projects between France (Génoplante), Spain and GABI.

Within GABI, important resources such as the GABI-KAT lines, the world's second largest T-DNA insertion line population, were generated and are available to the global research community. The transfer of the confirmed insertion lines from Cologne to the Nottingham Stock Center (U.K.) began in 2005 and will continue until the conclusion of the GABI-KAT project. The generation of plant resources for the analysis of natural diversity (natural accessions and experimental populations such as F1's, F2's, RIL's, NIL's), as well as their geno- and phenotyping to provide characterized biological material for researchers, is coordinated between colleagues from Génoplante (France) and GABI. A database summarising genetic and experimental data is under construction, and data warehousing, management and visualisation are primary foci for bioinformatics activities in GABI. GABI-Matrix at MIPS (GSF Munich) and the GABI-Primary Database (RZPD Berlin) are the two big centres for bioinformatics in GABI, flanked by many decentralized bioinformatics groups within the research institutions. ARAMEMNON, one of the world largest databases on *Arabidopsis thaliana* membrane transport proteins, was generated to aid in the identification, classification and characterization of novel transporters. The GABI TILLING facility is an example of a coordinated technological development that expands the worldwide capacity for TILLING screens in *Arabidopsis*.

Discussions have also started within the GABI community on how to continue research and development activities. GABI-FUTURE (2007-2013), the third funding phase of the national plant genomics program, is underway and is expected to increase the research budget significantly. GABI-FUTURE will continue to bundle fundamental and applied, but still pre-competitive, research activities within a single program. Public-private-partnerships, the backbone of the program, will continue and more partners will be needed for the gradual creation of a knowledge based bio-industry. Furthermore, basic research on crops will be improved to close the gaps in knowledge and to ease the technology transfer from *A. thaliana* to important crop plants. GABI and the AFGN played an important role during the establishment of the European Research Area Network on plant genomics (ERA PG). Out of the total annual budget of approximately 10 million Euros for the first joint call of the ERA PG, the two German funding agencies support German research groups with more than 3 million Euros per year.

GABI-related Arabidopsis tools and resources

- GABI: (www.gabi.de) 12 million €/year from the Federal Ministry of Education and Research (www.bmbf.de) and a Business Platform promoting GABI Plant Genome Research e.V. (WPG) (www.wirtschaftsverbund-gabi.de)
- GABI-KAT: (www.gabi-kat.de/)
- GABI-Matrix: (http://mips.gsf.de/projects/plants/)
- GABI-PD: (http://gabi.rzpd.de/)
- GABI-ARAMEMNON: (www.uni-koeln.de/math-nat-fak/botanik/bot2/agflue/HOME/projects/GABI_rkunze/index.html)
- GABI-TILLING: (www.gabi-till.de/index.de.html)