Abstract. This is the eighth Oberwolfach conference on the mathematics of tomography. Modalities represented at the workshop included X-ray tomography, sonar, radar, seismic imaging, ultrasound, electron microscopy, impedance imaging, photoacoustic tomography, elastography, vector tomography, and texture analysis.

Mathematics Subject Classification (2000): 65R32, 44A12, 92C55.

Introduction by the Organisers

This workshop included 46 researchers and graduate students from Europe, North America, and Asia. The participants represented a broad range of areas from pure mathematics to numerical analysis to medicine and industry. This interplay between pure mathematics and applications is one of the appeals of the field.

The first Oberwolfach tomography conference in 1980 helped define this young field, and the subsequent Oberwolfach workshops have reflected the growing breadth of the area. Modalities represented at this eighth conference include X-ray tomography, sonar, radar, seismic imaging, ultrasound, electron microscopy, impedance imaging, photoacoustic tomography, elastography, vector tomography, and texture analysis.

Frank Natterer, one of the pioneers in the field, started the conference by applying the Kaczmarz method to wave equation imaging in ultrasound. Ivana Jovanovic discussed ideas and algorithms in ultrasound, and Barbara Kaltenbacher analyzed convergence of Newton-Kaczmarz algorithms.

Local and limited data problems have been studied since the beginning of the field. Rolf Clackdoyle presented methods for two-dimensional region-of-interest
CT, and Samuli Siltanen presented his algorithm for x-ray tomography with very sparse data. Frederic Noo gave a reconstruction method for helical cone beam CT.

Esther Klann described a Mumford-Shah type level-set method to reconstruct and segment from SPECT/CT data, and Oliver Dorn spoke on reconstruction using level set methods.

Alexander Katsevich discussed his motion compensation algorithms for 2-D X-ray CT. Mohammad Dawood gave a motion correction method in 3D PET and CT, and Bernd Fischer described a motion correction algorithm for SPECT data.

Holger Kohr described his work using the approximate inverse in electron microscopy, and Todd Quinto analyzed a curvilinear Radon transform for large-field electron microscopy. Thomas Schuster presented work on vector tomography including diffraction and using an X-ray transform over geodesics.

Several types of tomography are modeled by circular or spherical integrals. Victor Palamodov developed a circular Radon transform for texture analysis on crystalline materials. Malte Spiess and Martin Riplinger spoke on an reconstruction method for stereology. Andreas Rieder presented a local reconstruction algorithm for spherical mean data, and Maarten de Hoop gave a multi-scale approach for seismology, and he showed reconstructions of the earth’s crust.

Guillaume Bal described his work on inverse transport and photoacoustics and John Schotland presented related results on inverse transport with large data sets. Leonid Kunyansky discussed his algorithm in acousto-electric tomography, and Otmar Scherzer described his work to correct for attenuation in photoacoustic tomography. Aref Lakhal provided an imaging method for Maxwell’s equation.

Martin Hanke described his algorithm for backscattering data in impedance tomography, and Bastian Harrach gave his linearization method for impedance tomography. Peter Maass presented his work on impedance tomography with sparsity constraints.

Ming Jiang gave a phase unwrapping algorithm in phase contrast imaging, SAR, and MRI. Joyce McLaughlin discussed recent advances and challenges for elastography imaging. Pierre Sabatier discussed the meaning of mathematical ideas, such as uniqueness, closeness, and well-posedness, in physical inverse problems.

Summing up, tomography is a lively branch of science with an inexhaustible supply of mathematical problems. Every new imaging modality poses new mathematical questions, and this conference can be viewed as a snapshot of this lively field.

We thank Prof. Dr. Greuel and the staff of the Mathematische Forschungsinstitut Oberwolfach for creating a stimulating environment to do serious mathematics. For seven participants, that hospitality extended for several days beyond the end of the conference when European airspace was closed by an ash cloud from an Icelandic volcano. Those participants are grateful to the MFO staff for making the time pleasant and productive. The organizers thank the MFO for their support of young mathematicians through E.U. and U.S. National Science Foundation grants.