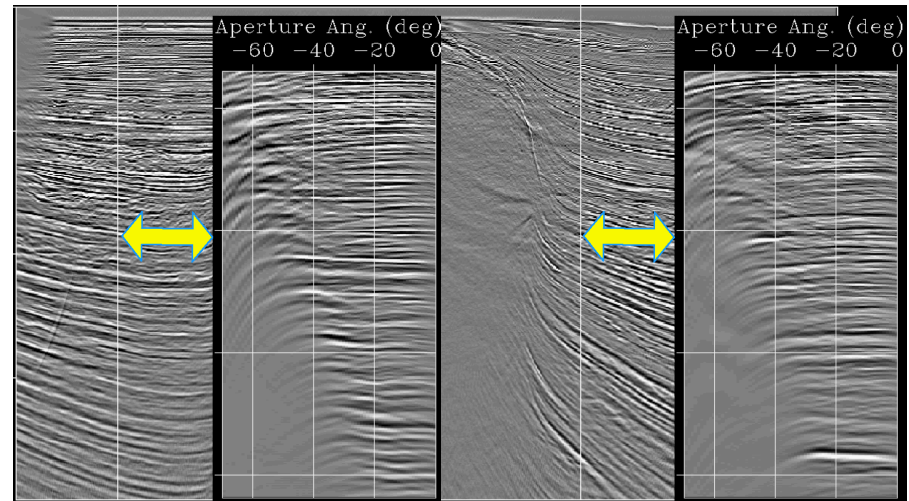
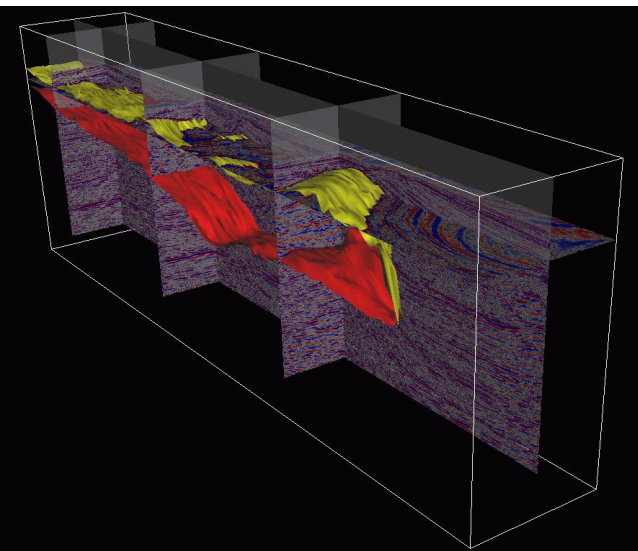


# GeoNeurale

## 3D Seismic Imaging Concepts and Applications

*Biondo Biondi*



# *3D Seismic Imaging Concepts and Applications*

MUNICH

at the

*GATE – Garching Technologie und Gründerzentrum*

3 DAYS COURSE

INSTRUCTOR: Dr. Biondo Biondi

LEVEL: Advanced

AUDIENCE: Seismic Interpreters, Processors, and Imagers, Petroleum Geologists and Geophysicists  
Reservoir Engineers.

COURSE FEES: 2450 Euro + VAT (19%)

ONLINE REGISTRATION: [www.GeoNeurale.com](http://www.GeoNeurale.com)

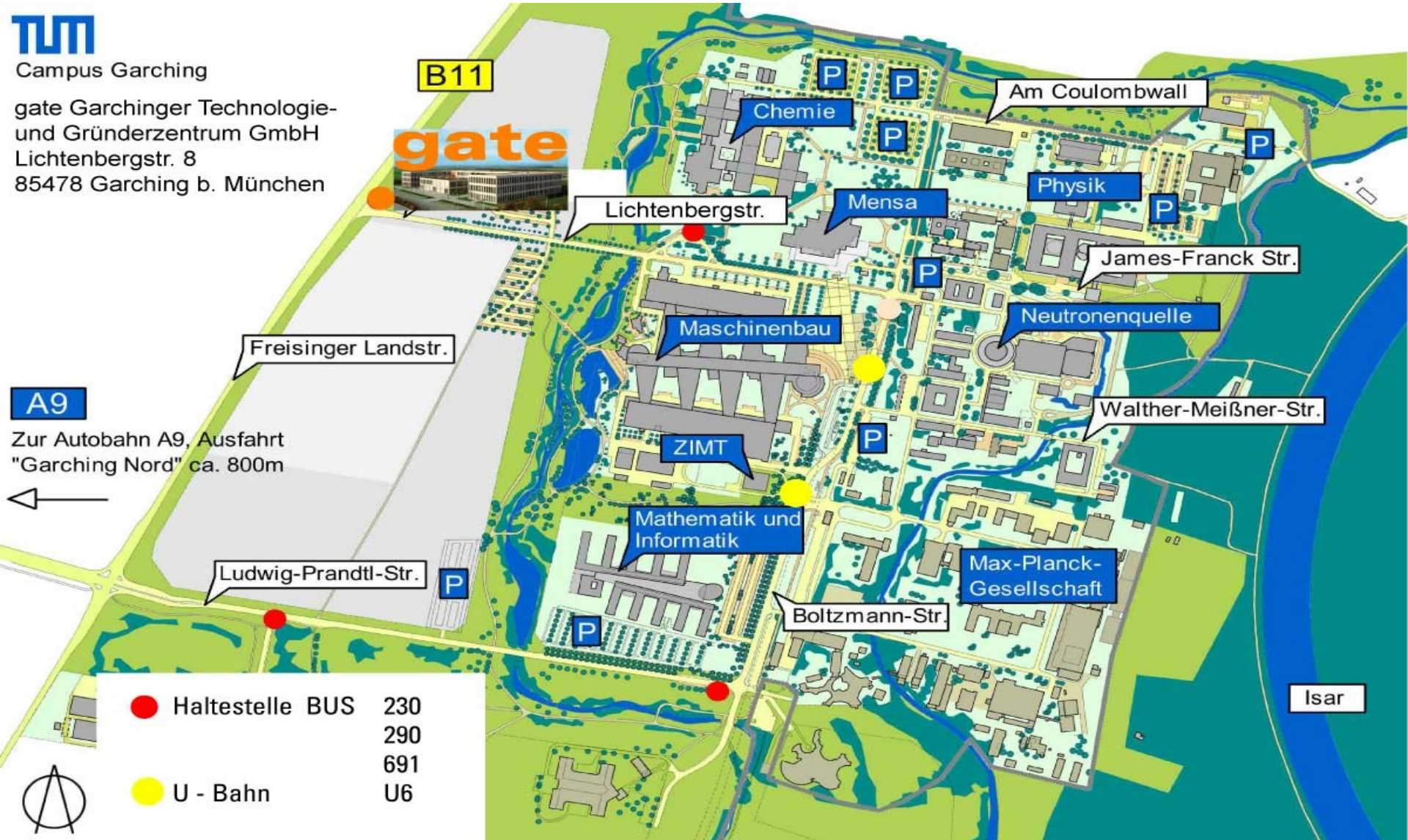


# GeoNeurale Office and Training Location at the Munich-Garching Research Center



Campus Garching

gate Garchinger Technologie-  
und Gründerzentrum GmbH  
Lichtenbergstr. 8  
85478 Garching b. München



A9

Zur Autobahn A9, Ausfahrt  
"Garching Nord" ca. 800m



- Haltestelle BUS 230, 290, 691, U6
- U - Bahn



# *3D Seismic Imaging Concepts and Applications*

The primary objective of this course is to provide broad and intuitive understanding of seismic imaging concepts and methods that enables geoscientists to make the appropriate decisions during acquisition, processing, imaging, and interpretation projects.

In particular, the course aims at providing interpreters and processors with a thorough understanding of all the factors that influence the quality of seismic images and consequently to employ the best available tools to solve the challenges presented by their specific data sets.

Another objective is to expose the audience to current trends in imaging research and empower them to adopt new technologies quickly.

All geosciences professionals that use or process seismic data should benefit from following this course.

I emphasize conceptual and graphical understanding and minimize the use of mathematical developments; therefore the course does not require a theoretical background in seismology and can be taken by a broad section of working geoscientists; this includes seismic interpreters, processors, and imagers as well petroleum geologist and reservoir engineers.

# PROGRAM

## *Introduction to 3-D seismic imaging*

The first segment introduces the basic concepts of 3-D seismic imaging. It establishes the background knowledge necessary for the subsequent problem-solving lectures. The main topics are:

- Commonly used data-acquisition geometries and their impact on imaging
- Seismic imaging as a data focusing process and Kirchhoff migration methods
- Partial prestack migration and other approximations to full prestack migration
- Principles of wavefield-continuation equation migration
- The relationship between seismic velocity and migration

## *A user guide to the migration toolbox*

There are an “infinite” number of choices among migration algorithms. This segment covers the whole range and provides objective criteria for picking the right algorithm for the specific problems at hand. The topics are:

- Time vs. depth migration
- Kirchhoff depth migration:
  - o Methods (travelttime computation, offset vs. angle domain)
  - o Strengths (flexibility, cost) and limitations (multi-pathing)
- Depth migration by wavefield-continuations:
  - o Methods (Shot-profile, Plane-wave, Common-azimuth)
  - o Strength (band-limited propagation) and limitations (angular accuracy)
- Specialized migration methods (anisotropic and converted-wave migration)
- Current trends in depth migration (Beam, plane-wave, and reverse time migration)

## *The never-ending quest for the perfect velocity model*

An inaccurate velocity model is the most likely culprit for poor imaging. This segment covers the fundamental concepts applied to estimate an accurate velocity model. The lectures starts from the simplest methods and ends with cutting-edge methods, as outlined below:

- Basic methods for velocity estimation (velocity spectra, Dix equation)
- Velocity estimation and complex structure
- Principles of reflection traveltime tomography
- Migration Velocity Analysis (MVA)
- Introducing geological knowledge in the MVA process
- Current trends in MVA (velocity scans, residual migration, Wave-Equation MVA)

## *Imaging, aliasing and incomplete subsurface illumination*

3-D seismic data are never adequately sampled at the surface. Furthermore, complex overburden often causes irregular and

incomplete illumination of the subsurface. This final segment discusses the imaging artifacts related to incomplete sampling and

the methods that can be used to eliminate these artifacts, as outlined below:

- Spatial aliasing and imaging artifacts caused by inadequate spatial sampling
- Avoiding aliasing in Kirchhoff migration and wavefield-continuation migration
- Imaging artifacts caused by irregular data geometry and incomplete illumination
- Illumination maps: how to use and not abuse them.
- Application of approximate regularized inversion to imaging enhancements:
  - o Data-domain methods (Data geometry regularization)
  - o Model-domain methods (Imaging by least-squares migration)

# *Biondo Biondi*

## BIOGRAPHY



Biondo Biondi is Associate Professor of Geophysics at Stanford University.

Biondo graduated from Politecnico di Milano in 1984 and received an M.S. (1988) and a Ph.D. (1990) in geophysics from Stanford.

He is co-director of the Stanford Exploration Project (SEP) and leads its efforts in 3-D seismic imaging. SEP is an academic consortium whose mission is to develop innovative seismic imaging methodologies and to educate the next generation of leaders in exploration seismology. SEP's activities are supported by about 30 companies involved in Oil & Gas exploration and production.

He has made contributions on several aspects of seismic imaging, ranging from velocity estimation to parallel algorithms for seismic migration.

Since the early nineties he has been at the forefront of the development of wave-equation 3-D prestack migration methods.

In 2004 the Society of Exploration Geophysicists (SEG) has honored Biondo with the Reginald Fessenden Award for his "development of azimuthal moveout (AMO), ... AMO has contributed to many other developments in the areas of migration, multiple attenuation and regularization of seismic data."

Biondo has recently written a book, 3-D Seismic Imaging, that is the first book to introduce the theory of seismic imaging from the 3-D perspective. The book is published by SEG in the Investigations in Geophysics series. During 2007 Biondo has given a one-day short course in approximately 30 cities around the world as the SEG/EAGE Distinguished Short Course Instructor (DISC) .

Biondo is in close contact with the practical applications of seismic imaging by his involvement with 3DGeo Development that he co-founded in 1994. 3DGeo Development, which has recently merged with FusionGeo, brings innovative technologies to the exploration industry such as wave-equation imaging and Internet based seismic processing.

# Registration Details

•Course fee: 2450 Euro + VAT (19%)

## Payment and Registration

Tuition fees are due and payable in Euro upon enrollment in the course by bank transfer to the bank account given below unless another payment form is agreed

Unless otherwise indicated, the payment should be received before the date specified in the invoice as payment term to make the enrollment effective.

To register to the course please fill in the [registration form](#) and fax or email it along with the confirmation of your bank transfer to:

GeoNeurale

Am Nymphenbad 8

81245 Munich

T +49 89 8969 1118

F +49 89 8969 1117

ONLINE REGISTRATION: [www.GeoNeurale.com](http://www.GeoNeurale.com)

**Bank Information:** Genossenschaftsbank EG Muenchen

Bank Account N. 519618

BIC – Code : GENODEF 1M07

BLZ 701 694 64

IBAN : DE19 7016 9464 0000 5196 18

Please indicate your name and the purpose: "3D Seismic Imaging Concepts and Applications - course fees".

[www.GeoNeurale.com](http://www.GeoNeurale.com)

## Provisions

Tuition fees are due and payable in Euro upon enrollment in the course. Unless otherwise indicated, fees do not include student travel costs and living expenses.

Payments are also accepted via personal or company check, traveler's check, credit card, and Company Purchase Orders.

### Cancellations by Participant:

All cancellations are subject to a 100 Euro non-refundable cancellation fee.

Cancellations have to be notified to our office, at least 30 days prior to the course start date to receive a refund (less the 100 Euro cancellation fee).

If the participants are unable to cancel prior to the 32 days notification date, they may substitute another person at their place in a course by notifying us prior to the course start date.

### Course Cancellations:

GeoNeurale reserves the right to cancel the courses if necessary. The decision to cancel a course is made at least two weeks prior to the course start date. If a course is cancelled, the participant will receive a full reimbursement of the tuition fees (but not of the plane ticket or hotel expenses or any other costs), or will be enrolled in another course upon his decision (the cost of the original course will be applied to the cost of the replacement course).

GeoNeurale can not be responsible for any penalties incurred for cancellation or change of airline or hotel reservations.

### Refunds:

GeoNeurale will promptly remit all refunds of tuition fees due to cancellations or annulment (less any appropriate non-refundable cancellation fee) within 30 days of the course cancellation.

### Force Majeure:

GeoNeurale can not be responsible for cancellations due to "force majeure" events: airplane or airport strikes, emergency situations, natural catastrophes and all situations and incidents independent or outside the human control that can delay or cancel the course. In case of such events related cancellations the course tuition fees will be refunded to the client.

GeoNeurale is not responsible for any delay or absence caused by the training instructor or training instructor company for reasons which are independent or out of the control of GeoNeurale's decisions.

**AGREEMENT:** Upon enrollment all parties accept the above mentioned provisions. The above specified provisions shall regulate the agreement between GeoNeurale and the participant and the participant company and will enter into force upon enrollment.

## **REGISTRATION FORM**

Please fill out this form and Fax to +49 89 8969 1117

or Email to Courses@GeoNeurale.com

### *3D Seismic Imaging Concepts and Applications*

Munich

Course Fee: 2450 Euro + VAT (19%)

Name:

Company:

Address:

Job Title:

Phone:

Fax:

Email:

[www.GeoNeurale.com](http://www.GeoNeurale.com)

SIGNATURE: \_\_\_\_\_

# INFORMATIONS, HOTELS, MAPS, LINKS

## TRAINING LOCATION – RESEARCH CENTER

<http://www.geoneurale.com/documents/GATE-Y7.pdf>

## GATE GARCHING

<http://www.geoneurale.com/documents/GATE-Y6.pdf>

## MAP MUNICH-GARCHING

<http://www.muenchen.city-map.de/city/db/13020800001/14269/Garching.html>

## MUNICH INFO and MAP MUNICH CENTRAL

<http://www.muenchen.de/home/60093/Homepage.html>

## MAP MUNICH UNDERGROUND

<http://www.mvv-muenchen.de/web4archiv/objects/download/3/netz1207englisch.pdf>

## HOTELS NEAR GeoNeurale

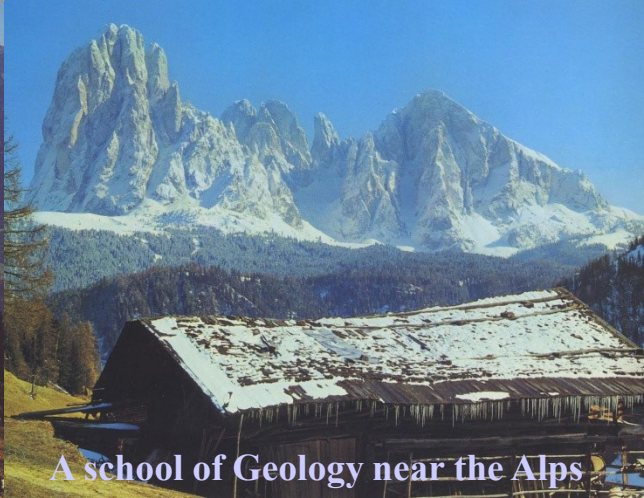
<http://www.geoneurale.com/documents/HOTELS-GARCHING.pdf>

## BAVARIA INFO

<http://www.geoneurale.com/documents/Around-Munich-Info.pdf>

- Munich, the capital of Bavaria with a population of 1.5 million is the third largest city in Germany. Headquarters to industrial giants like BMW, Siemens, MAN, EADS, Eurocopter, Infineon and Epcos it also hosts two of the most important universities in Germany: the "Technische Universitaet Muenchen" and the "Ludwig Maximilian Universitaet" , with international research centers such as the "Max Plank Institut" and the "Fraunhofer Gesellschaft" .
- Geologically important is the presence of carbonate formations in the subsoil that are very favourable for low enthalpy geothermal exploitation, which requires the solution of complex petrophysical problems, similar to Oil Exploration.
- GeoNeurale, the society for the Geosciences applications of Geostatistics and Neural Networks promotes the development of modern interpretation methods for reservoir analysis.

[www.GeoNeurale.com](http://www.GeoNeurale.com)



A school of Geology near the Alps