

INTERNATIONAL HYDROGRAPHIC  
ORGANIZATION



ORGANISATION HYDROGRAPHIQUE  
INTERNATIONALE

Dossier du BHI N° TA-6-1

LETTRE CIRCULAIRE No. 87/2008  
7 novembre 2008

**COURS SUR LES SYSTEMES DE SONDAGE MULTIFAISCEAUX  
ORGANISE EN COLLABORATION AVEC LE SERVICE HYDROGRAPHIQUE NORVEGIEN**

Madame la Directrice, Monsieur le Directeur,

1 Le BHI a l'honneur de vous annoncer que le Service hydrographique norvégien collaborera à l'organisation du 50e cours de formation sur les sondeurs multifaisceaux UNI-OMB/UNH-CCOM, à Stavanger, Norvège, du 16 au 21 mars 2009.

2 Les détails du cours sont fournis en pièce jointe et sont également disponibles dans la section « renforcement des capacités » sur le site web de l'OHI, sous « opportunités de formation ».

Veillez agréer, Madame la Directrice, Monsieur le Directeur, l'assurance de ma haute considération,

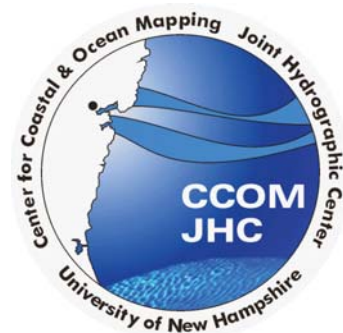
Pour le Comité de direction,

A handwritten signature in blue ink, appearing to be 'H. Gorziglia', is written over a faint circular stamp.

Capitaine de vaisseau Hugo GORZIGLIA  
Directeur

PJ.: Annonce du 50e cours de formation sur les systèmes de sondage multifaisceaux UNB-OMB / UNH-CCOM.

**50th UNB-OMB / UNH-CCOM  
Multibeam Sonar Training Course  
Stavanger Norway, March 16 to 21, 2009**



**Co-hosted by  
The Norwegian Hydrographic Service**

**When:** From 0800H Monday 16 March 2009  
To 1630H Saturday 21 March 2009

**Where:** Victoria Hotel,  
Skansegaten 1, 4006 Stavanger, Norway  
<http://www.victoria-hotel.no/engelsk/index.cfm>  
[58° 58' 23.34"N, 5° 43' 47.53"E]

**Cost:** The registration fee is USD 3,800 which includes course materials and lunch for 6 days, but not accommodation.

**Accommodation:** Is available at the Victoria Hotel  
<http://www.victoria-hotel.no/engelsk/index.cfm>  
from NOK1245 /night (single); NOK 1495 /night (double)  
Breakfast is included.

For Bookings, contact hotel by 11 February 2009 at  
<mailto:victoria@victoria-hotel.no>  
Tel: +47 51 86 70 00  
Fax: +47 51 86 70 10

**For more details, do not hesitate to contact:**

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### Course Description

This six-day, 36-lecture course is designed to provide a theoretical and practical background in marine swath survey technology and techniques for hydrographic surveys, continental shelf boundary delimitation, offshore engineering, harbour dredging, fisheries habitat, route survey and scientific research, and provides overviews of:

- the technology and problems associated with shallow water multibeam surveys,
- processing and visualization techniques designed to address the complexities of swath mapping,
- constraints on using swath bathymetry to produce highest quality data.

Day	Lecture	Topic	Instructor	
Monday	<b>INTRODUCTION AND REVIEW OF FUNDAMENTAL CONCEPTS</b>			
	01	Historical Perspective and Course Overview	JHC	
	02	Fundamentals of Echo-Sounding	CdM	
	03	Oceanographic and Geologic Concepts	LM	
	04	Fundamentals of Sonar	CdM	
	05	Spatial Referencing Terms and Concepts	DW	
	06	Visualization Terms and Concepts	LM	
Tuesday	07	Hydrographic Performance Standards	DW	
	<b>SWATH SONAR ISSUES</b>			
	08	Sidescan Sonar Methods (Single & Multi-row)	CdM	
	09	Multibeam Sonar Methods	CdM	
	10	Bottom Detection Methods	CdM	
	11	Sidescan / Backscatter Imaging with Swath Sonars	JHC	
	<b>ANCILLARY SENSOR ISSUES</b>			
	12	Multisensor Integration for Swath Bathymetric Systems	JHC	
	Wednesday	13	Sound Refraction in the Water Column	CdM
		14	Refraction Operational Limitations due to Watermass Variability	JHC
		15	Horizontal, Vertical & Orientation Positioning Requirements	DW
16		Positioning Models and Methods I	DW	
17		Positioning Methods II	DW	
18		Error Estimation in Swath Methods	LM	
Thursday	<b>SEABED ACOUSTIC BACKSCATTER</b>			
	19	Acoustic Seabed Interaction Theory	CdM	
	20	Acoustic Backscatter Image Interpretation	JHC	
	21	Introduction to Seafloor Characterization	LM	
	22	Oblique Incidence Characterization Methods	CdM	
	<b>SURVEY DESIGN AND QUALITY CONTROL</b>			
	23	Survey Design and Planning	LM	
24	The Patch Test and Sensor to Ship Reference Frame Alignment	JHC		
Friday	25	Requirements for Decimetre Bathymetry	DW	
	26	Field Quality Control: Dynamic Error Recognition and Analysis	JHC	
	<b>DATA PROCESSING</b>			
Saturday	27	DTM Generation Methods & Pitfalls	CdM	
	28	Swath Bathymetry Data Cleaning – Interactive and Automated	JHC	
	29	Data Reduction for Chart Compilation Purposes	JHC	
	30	The Swath Processing Pipeline	LM	
	31	Impact and Management of Dense Digital Bathymetry	DW	
<b>CURRENT &amp; FUTURE TECHNOLOGY</b>				
32	Alternative Approaches for High Density Bathymetric Data Collection	LM		
33	Characteristics of Available Swath Sonar Systems	CdM		
34	Operational Field Trials: Assessing Performance	JHC		
35	New Data Presentation Methods	LM		
36	Course Roundup and Discussion on Emerging Issues	ALL		

## **Advance preparation by attendees**

This course is very intensive and fast-paced. Attendees come from various backgrounds and some have found they benefited from some pre-reading for the course. There is no mandatory preparation but we recommend the following resources be consulted by those feeling the need for such preparation:

### **Available at no cost:**

International Hydrographic Organization Publication M-13 *Manual on Hydrography* (2005, corrected May 11, 2007), particularly chapters 2, 3, 4 and 7  
[http://www.iho.shom.fr/PUBLICATIONS/download\\_M13.htm](http://www.iho.shom.fr/PUBLICATIONS/download_M13.htm)

L3 Seabeam's *Multibeam Sonar Theory of Operations Manual* at  
<http://www.mbari.org/data/mbsystem/formatdoc/>  
(scroll down to "*How Mapping Sonars Work*" for 7 downloadable pdf files)

Chapter 11: "Acoustic multibeam survey systems for deep-draft navigation projects" in the US Army Corps of Engineers *Hydrographic Engineer Manual* (2002, corrected Apr 2004) free download at  
<http://www.usace.army.mil/inet/usace-docs/eng-manuals/em1110-2-1003/toc.htm>

Chapter 11 "Acoustic (single- and multibeam) and airborne sounding methods, sidescan and oblique sonars" de Jong, Lachapelle, Skone & Elema (2002) *Hydrography* 351 pp. ISBN 9040723591 Euro 29.50.  
<http://www.vssd.nl/hlf/landmeet.html#hydro>

The MB-System Cookbook  
<http://www.mbari.org/data/mbsystem/mb-cookbook/index.html>

### **Available for purchase:**

Chapter 9: "Sonar" by Lloyd Huff and Guy Noll, in the book edited by David Maune (2007) *Digital Elevation Model Technologies and Applications: The DEM Users Guide, 2<sup>nd</sup> Edition* ASPRS publications, ISBN 1570830827 \$155  
<https://eserv.asprs.org/eseries/source/Orders/index.cfm>

Chapter 8: "Underwater acoustic mapping systems" in Xavier Lurton (2002) *An Introduction to Underwater Acoustics: Principles and Applications* 347 pp. Springer Verlag ISBN 3540429670 \$159  
<http://www.springer.com/west/home?SGWID=4-102-22-2225124-0&changeHeader=true>

R.J. Urick (1983) *Principles of underwater sound*, 3rd Ed. Peninsula Publishing, ISBN 0-932146-62-7 \$71 in the USA, \$76 international price.  
<http://www.peninsulapublishing.com>

**Registration Form**  
**50th UNB-OMB / UNH-CCOM Multibeam Sonar Training Course**  
**Stavanger Norway, March 16 to 21, 2009**

**Instructions:**

Manual method - print this page, fill in, and **fax to +1-506-454-0352**.

Acrobat method - download free Acrobat Reader <<http://www.adobe.com/go/reader>>, open this document and fill in under Acrobat, save and **email to <dew@unb.ca>**

Name: \_\_\_\_\_

Company: \_\_\_\_\_

Address: \_\_\_\_\_

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Phone: \_\_\_\_\_

Fax: \_\_\_\_\_

E-mail: \_\_\_\_\_

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Briefly describe your past experience with Multibeam Sonar Systems; and/or

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future plans for work with Multibeam Systems.

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