

**WG-3 : WORKING GROUP ON  
RESEARCH AND EDUCATION  
OBJECTIVES, STATUS AND RECOMMENDATIONS**

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*Reliability, safety and Robustness*

*Human resources competence with*

*'Ethics' is the mantra of success in knowledge society*

# Non - Destructive Testing & Evaluation

A few facts :

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- ☀ Multi disciplinary science and technology encompassing - material science, physics, sensors, robotics, electronics, instrumentation, information technology, computational methods, artificial intelligence....
- ☀ New techniques are continuously evolving based on the needs of the industry.
- New techniques are needed for say nano-technology

❖ Advanced techniques concentrated in a few centres of excellence internationally.

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☑ For global prosperity, NDE technology needs

➤ to Spread

➤ to be Harnessed

➤ to be Harmonised

*To provide for better quality of life on "Earth" - planet and sustain all manifestations of nature.*

## What we need ....

- **Maintain and enhance competence of the personnel**
- **The advances and developments that take place are to be disseminated appropriately.**

**Generate specialised human resources needed for NDE applications.**

**Sensitise and inculcate the required interest and competence right from the basic degree level so that young students and researchers get motivated.**

## Objective of this Working Group (WG-3)

- Motivate the young students and researchers into the fascinating field of NDE Science and technology.
  - Introduction of NDE in curriculum
  - Standardisation of NDE curriculum
  - Attract bright young minds to the challenging research and rewarding careers
- Synergise linkages between institutions, industries, academics bodies, professional societies, standardisation institutes and regulatory bodies.
- Nurture and Recognise Professional Competence and Excellence
- Identify weak links in converting mature research to new standards - (A good example synergy between ISO and IIW)

# Working Group should primarily focus on Promotion of NDE in

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## Education

- ★ Development and harmonisation of educational and training materials,

## Research

- ★ Cooperative and outreach programs with national and international industry / groups for promoting worldwide safety, product quality and economic well being of people - emphasis on need based research

## Industry

- ★ Monographs and continuing education programs

# Education

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- Development of modules in NDE science and technology for value addition to undergraduate and postgraduate students in engineering and post graduate students in science (physics, materials science) to prepare them for application of NDE judiciously and have a capacity for absorbing new developments in NDE science and technology.
- Integrated NDE curriculum for undergraduate and postgraduate levels



# Research

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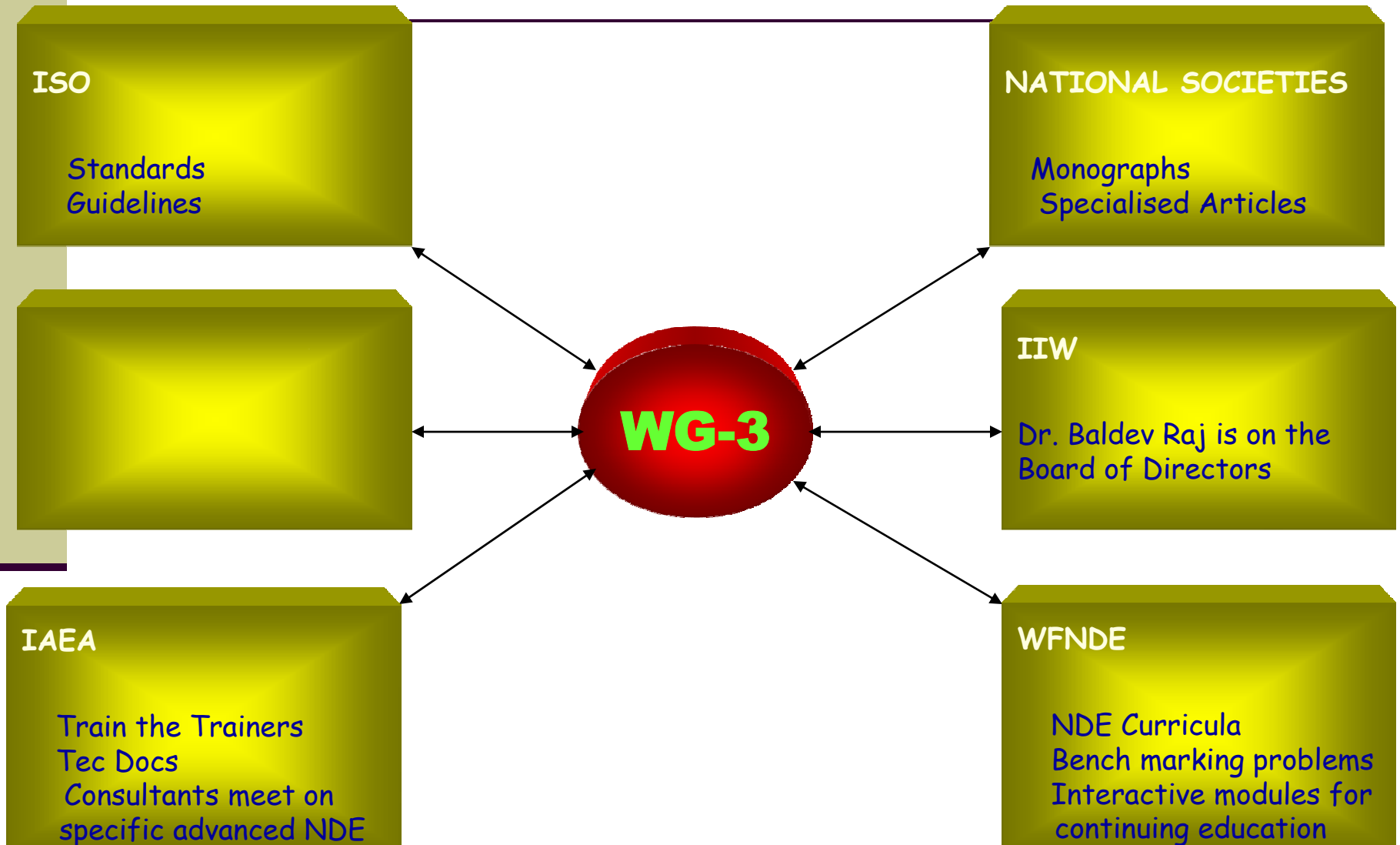
- ⇒ Prioritise high impact and generic research areas such as Data Fusion
- ⇒ Special sessions in major international events on Frontiers of Research (16th WCNDT starting point) and is being planned in 17th WCNDT (yet to contact organisers)
- ⇒ Special thematic workshops nationally and internationally
- ⇒ Identification of bench mark problems and round robin experiments

# Industry

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- ⇒ Continuing Education programs tailor made to suit industrial needs for various advanced methods
- ⇒ Monographs and books with international perspectives
- ⇒ Interactive mechanisms with university and research organisations (linkage with WFNDE Centres)

# WG-3 Proposes to achieve these objectives through synergising linkages with...



# Monographs

- (a) Advanced NDE (IAEA)
- (b) NDE of Concrete Structures
- (c) IR imaging principles and NDE applications
- (d) Applications of electromagnetic radiations in materials characterisation( X-rays and synchrotron radiation)
- (e) NDE of Art Objects
- Necessary actions initiated for (b) and (e) by the Working group. Topics identified for (a) and (e).

# WG-3 ACTIVITIES - ROAD MAP

PERIOD : 2004 - 2008 (Proposal in 2004)

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MONOGRAPHS (4) : BY 2007

EDITORIAL BOARD : INTERNATIONAL EXPERTS

FUNDING(PUBLICATION) : 75 % (INDIA)  
ISNT-QUNEST

DISTRIBUTION : ICNDT

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(Proposal put forward again during Cairo Meet 2006)

# INTERACTIVE MODULES

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**Continuing Education Programs (WG3-  
IAEA AND NATIONAL BODIES)**

**Conventional NDE PT, MT, RT and UT**

**Beta Version - 2007**

# WG-3 - Working Group

Any Suggestions ?

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Chairman- Dr. Baldev Raj

Members : Dr. Issac Einav (IAEA)

(alphabetical) Mr. John Thompson, UK (EFNDT)

Prof. M.Kroning (IZFP)

Dr. Mike Turnbow, USA

Dr. Richard Murphy, ISO

Dr. Satish Udpa (WFNDE)

Prof S. J. Song, Korea

Prof. Uwe Ewert (BAM)

Dr. B.Venkatraman - Member Secretary

One member each from China, Japan, African Region

# Monograph

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- ⇒ **Enrich individual professionals**
- ⇒ **Kindle young minds**
- ⇒ **Help quality and NDT personnel to increase awareness / interest in techniques and technologies**



# Monograph

on

## Infrared Thermography

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1. Introduction
2. Physics of Infrared Imaging
3. Infrared Systems and Engineering
4. IR Imaging Techniques
5. Factors Affecting Thermal Measurements
6. Applications of Infrared Thermography
7. Infrared Thermography for Materials Characterisation
8. Modelling and ANN in Thermal NDE
9. Comparison of Infrared Thermography with other NDE Methods
10. Bibliography
11. Index

# Contributors

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Prof. Xavier Maldague, Canada (E)

Prof. Ermanno Grinzato, Italy (E)

Prof. Vavilov, Russia

Prof. Busse, Germany

Dr. Baldev Raj - India (E)

Dr.B.Venkatraman - India (E)

Dr. Avedilidis, Greece

Prof. Balageas, France

Steven M.Shepard, USA

E - editors

# Monograph

on

## "NDT for Cultural Heritage"

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1. Overview of NDE Methods Applicable to Objects of Cultural Heritage
2. NDE of Metallic Objects
3. NDE for Paintings
4. NDE for Historical Structures
5. Conservation of Metallic Objects and Paintings
6. Image and Data Fusion and data management
7. Case Studies

# This monograph for

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- ⇒ Increase awareness
- ⇒ To stimulate interest world wide on the role of NDE in conservation and characterization of objects of cultural heritage
- ⇒ To form a reference guide / text material for curators, conservationists and archaeologists and researchers involved in the field of conservation and characterization of cultural heritage objects.

## Contributors

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Prof. Ermanno Grinzato, Italy

Prof. Ludwig, Italy

Dr. Jurgen Goebbels Germany

Dr. Baldev Raj, India

Prof. K.Roessler, Germany

Dr. B.Venkatraman - India

Suggestions

## Status - Monographs

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Editors Identified

Authors and Chapters identified

**MODIFIED PROPOSAL**



# Financial Commitments

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Honorarium to Editors

Honorarium to Chapter Contributors

Printing Expenses Approx. total expenses per monograph of 4 editors and 4 additional authors and printing charges

~\$10,000

## PROPOSAL

WG-3 to work out the cost and distribution dynamics at no cost to ICNDT.

## Publication and Distribution

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Published by reputed international publishing house

One complimentary copy to each ICNDT member society

Financial Liability to ICNDT : Nil



# Activity -II

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**International workshop on Imaging NDE**  
**April 25-28, 2007**

**Organised by**

Indira Gandhi Centre Atomic Research, Kalpakkam  
Fraunhofer Institute of NDT (IZFP) Germany  
Federal Institute of Material Research (BAM),  
Berlin

Indian Society for Non-destructive Testing (ISNT)  
Kalpakkam

QUNEST, India

Q-Net, India

# Topics

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## Radiography

- Advance in film Based Radiography
- Digitisation
- Real time Radiography
- Digital Radiography (Flat panels)
- Computer Radiography
- Computer Tomography
- Image Processing Tools for Enhancement
- Codes, Standards, Qualification.
- Industrial Case studies - Digital Radiography,
- Computer Radiography Tomography

## Thermal Imaging

- Fundamentals and Techniques
- Pulsed and pulse phase thermography
- Lock in thermography
- Materials characterisation
- Applications
- Application of transform, ANN and image processing tool

## Ultrasonics

Conventional UT  
SAFT, IRIS  
Phased Array  
Time of Flight Diffraction  
Sampling phased Array  
Application of Digital signal processing methodologies

## Special Thematic Sessions

NDE for conservation of objects of cultural Heritage  
  
Automation  
Detectors and Networking  
Image data fusion

# ORGANISING COMMITTEE

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<b>Conference Chairman</b>	:	Dr Baldev Raj
<b>Co-Chairmen</b>	:	Prof . Michael Kroning Prof. Uwe Ewert
<b>Secretary</b>	:	Dr. B. Venkatraman
<b>Speakers</b>	:	IZFP, BAM, Prof Maldague (Canada) Prof Grinzato (Italy) M.G.Silk* UK, Mike Turnbow*, USA and few others India

\* Yet to contact. Others have confirmed.

# WE PROPOSE FOLLOWING PATRONS

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- President ICNDT
- President EFNDT
- President APCNDT
- President ASNT
- President WCNDT

WORKSHOP MAY BE SUPPORTED BY **ICNDT**  
(LOGO WOULD BE PUT ON CONFERENCE COVER)

Liability to ICNDT : Nil

Part proceeds from conference to be utilized for printing monographs as per .

ICNDT

# Inputs and Suggestions from PGPC

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Publication of Monographs

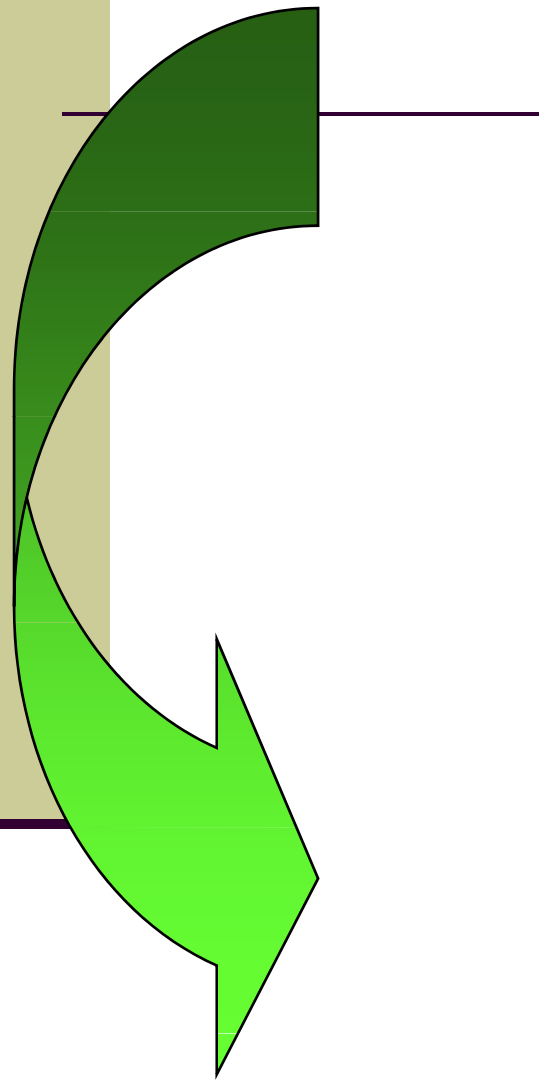
Workshop on Imaging

Links with WFNDE centres for Education and  
Continuing Education

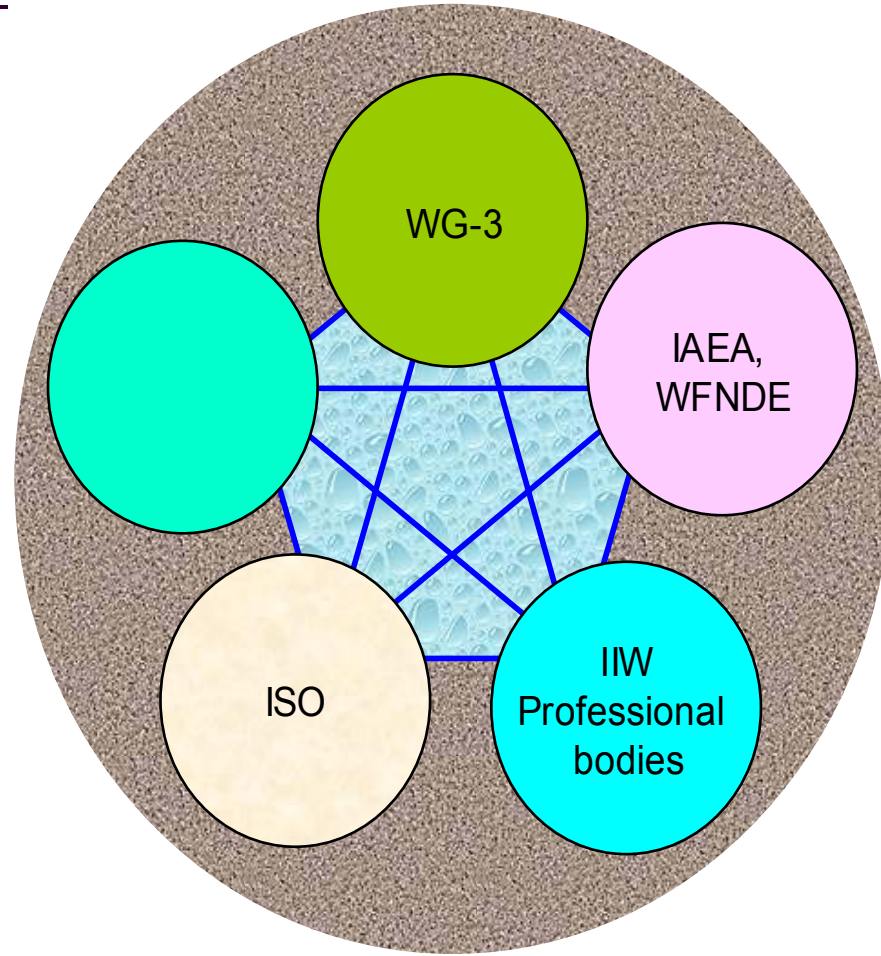
Catalytic

ICNDT

Feedbacks



Inputs



NATIONAL SOCIETIES



Linkages



*THANK YOU*