WINNER mBillionth South Asia Award 2017: in Learning and Education Category for Android Mobile App

NDLI: VISION & MISSION

NMEICT: National Mission on Education Through Information and Communication Technology
BUILD UP
NATIONAL DIGITAL LIBRARY OF INDIA
AS A NATIONAL KNOWLEDGE ASSET –
THE KEY DRIVING FORCE FOR EDUCATION,
RESEARCH, INNOVATION, AND
KNOWLEDGE ECONOMY IN INDIA
NDL Mission

To create a 24x7-enabled integrated NDL as a ubiquitous digital knowledge source of the nation – catering to immersive e-learning for all learners at all levels in all areas.

To initiate a movement for integrated digital learning across India.
NDL Motto

INCLUSIVE

&

OPEN
Libraries are more important to the education system than the institutions such as schools, colleges and universities

– Rabindranath Tagore
National Digital Library: Issues

**User-side**
- Wide geographic expanse & Large population
- Huge number of students
- Large number of institutions
- Varied linguistic diversity
- Severe lack of Teachers

**Provider-side**
- Wealth of digital content
  - Books and Articles
  - ETD
  - Question Papers and Solutions
  - Video Lectures - MOOCs
  - Simulations & Animations
  - NMEICT Projects
  - Data
  - ...
- No single-window search
- Google search uses keyword – no metadata search
- Widely varied DL technology
- Lack of Interactivity, Vernacular support
- Low integration between content and learning system
- Weak ecosystem between learners and teachers
Use Models

Physically Challenged
Researchers
Learners
Professionals

Content Access

Content Contribution
Contributing Institutions

Institutional Digital Repositories
Web Content Harvesting
Web Content

NDL Repository
Learning Management System
Educators

IIT, Kharagpur
Presentation Model

- Not a new library – an umbrella
- Collects and ingests metadata only
- Presents full-text from source view
- Provides:
  - Search
  - Browse
Objective and Scope

TARGETS
CONTENTS,
STAKEHOLDERS,
CONTRIBUTORS,
USERS,
ARCHITECTURE, AND
THE BIG PICTURE

IIT, Kharagpur

Objective and Scope

TARGETS
CONTENTS,
STAKEHOLDERS,
CONTRIBUTORS,
USERS,
ARCHITECTURE, AND
THE BIG PICTURE

S R Ranganathan Laws

1. Books are for use
2. Every reader his [or her] book
3. Every book its reader
4. Save the time of the reader
5. The Library is a growing organism

IIT, Kharagpur
Objectives

- **A 24X7-enabled Infrastructure** for NDLI with single window search facility – To include h/w systems, n/w, s/w tools, applications and interoperability
- **Harvest IDR**s across institutions of the nation to provide integrated access
- Facilitate select institutes to disseminate existing content and create new digital content
- **Immersive E-learning environments** at multiple levels spanning across
  - All academic levels – school to life-long learning
  - All disciplines – Science, Arts, Engineering, Medical, Law, and
  - All languages – used as medium of instruction.
- **Interfaces in Indian Languages & for DA**
Digital Contents

Digital, Surrogate
Digital, Metadata
Digital, etc.

• Content at NDL
  ○ Born-digital object
  ○ Digital surrogate of a physical object
  ○ Digital metadata of physical object

• Metadata at NDL
  ○ NDL does not store contents
  ○ NDL only ingests metadata for Search & Browse
  ○ Content (Full-text) is delivered from Source

A content is included (metadata ingested) in NDL if it is expected to have educational value
Institutional Digital Repository of Contributing Institutes

Range of Contents

- Faculty Publications, ETD (Electronic Thesis & Dissertation): DSc-PhD-Masters-Undergrad, Research Projects
- Books & Periodicals, Open Access Journals, E-Books & Subscribed E-Resource
- Annual Reports, Project Reports, Convocation, Working Papers, Others
- Encyclopaedia Dictionaries Directories Others
- Lecture Slides, Videos, Class Notes, Courseware
- Term Papers, Assignments, Solutions
- Lab Experiments, Manuals, Case Studies
- Question Banks (JEE / GATE / NET / CAT), Model Answers

Institutions of School & Higher Education, Boards

Research and Professional Institutions, Central / State University

Institutional and Open Contributions. Multi-modal, Multi-faceted

- Datasets, Benchmarks, Models, Maps, Software
- Manuscripts, Painting, Sculpture, Music, Dance, Drama
- Audio & Video Content
Content View Architecture

Vertical-Specific Custom Interface and Search

- School Vertical
- Domain Vertical (Medical/ Legal/…)
- Competitive Exam Vertical
- Data Vertical
- Application Vertical

Generic Interface and Search

Search

IIT, Kharagpur
## Stakeholders

### Roles and Responsibilities

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Roles and Responsibility</th>
</tr>
</thead>
</table>
| **Government** | 1. Sponsor and facilitator  
2. Content Contributor  
   - Ministries / Departments  
   - R & D Labs |
| **Institutions** | 1. Host Institution – IIT Kharagpur  
2. Contributing Institution – Supporting IDRss  
3. Participating Institution – Providing Users & Feedback |
| **Public**     | 1. Use and Feedback  
2. Metadata by Crowd Sourcing  
3. Content by Crowd Sourcing |
| **Industry**   | 1. Technology Providers |
| **Publishers** | 1. Metadata Provider  
2. Content Provider (under various licensing schemes) |
Contributors

CFTI, State and Central Universities, R & D Labs, Govt. Depts, Free Portals, Publishers, etc.
Users & Access

Individual

- Registration is Open to all
- Registration Types:
  - Individual
    - Registers directly
  - Institutional
    - By request from Institution
    - Managed by authenticated Nodal Person
    - Convenient for bulk upload of users

Institutional

NDL Users

College
Professional
Life-long Learner

School
- Index Management
  - Ingestion of Metadata
  - Indexing of Metadata for Search
- Content Management
  - Dissemination of local contents
- Learning Management
  - Creation of Content
  - Handling learning interactions
National Digital Initiative in Education

The Big Picture

Knowledge Repository: Internet, Mobile

National Digital Library of India

SWAYAM, SWAYAM Prabha, GIAN

Credit Transfer and Virtual Certification (NAD)

Up to 20 credits from MOOCs

School, Certificate, Diploma, UG & PG: Internet

SWAYAM: instrument for self-actualisation

SWAYAM Prabha: 32 DTH, 24x7

School, UG, PG, Open U, IIT PAL: TV – DTH

IIT, Kharagpur
Where the mind is without fear and the head is held high  
Where knowledge is free  
Where the world has not been broken up into fragments  
By narrow domestic walls  
Where words come out from the depth of truth  
Where tireless striving stretches its arms towards perfection  
Where the clear stream of reason has not lost its way  
Into the dreary desert sand of dead habit  
Where the mind is led forward by thee  
Into ever-widening thought and action  
Into that heaven of freedom, my Father, let my country awake.

– Rabindranath Tagore
Landing Page

National Digital Library of India

Educational materials are available for users ranging from primary to post-graduate levels.

About National Digital Library of India

Learning Resource Type

Subject Domain

Featured Sources

News and Events

IIT, Kharagpur
Home Page
Refine Search (Author) Page
Title: Transport, magnetic, and Sn-119 Mossbauer studies on magnetically ordered valence fluctuating compound SmRuSn3

Authors: MAZUMDAR, C
HOSSAIN, Z
NAGARAJAN, R
GODART, C
DHAR, SK
GUPTA, LC
PADALIA, BD
VIJAYARAGHAVAN, R

Keywords: cerusn3

Issue Date: 1996

Publisher: AMER INST PHYSICS

Citation: JOURNAL OF APPLIED PHYSICS, 79(6)6349-6351

Abstract: SmRuSn3 is a unique compound among the known Sm-based valence fluctuation (VF) systems. Its crystallographic structure has two inequivalent Sm sites and Sm ions at only one of them are in VF state while the Sm ions in the other site orders magnetically. Our (119)Mossbauer studies show a quadrupolar splitting at the Sn site, consistent with the noncubic symmetry of the Sn site. A broadening of the Mossbauer spectrum is seen due to magnetic ordering of the material. The transferred hyperfine field at Sn site at 4.2 K is small. (C) 1996 American Institute of Physics.

URI: http://dx.doi.org/10.1063/1.361996
http://dspace.library.iitb.ac.in/xmlui/handle/10054/14612
http://hdl.handle.net/100/1441

ISSN: 0021-8979

Appears in Collections: Proceedings papers
Transport, magnetic, and Sn-119 Mossbauer studies on magnetically ordered valence fluctuating compound SmRuSn3

Author: Mavsumdar, C., Hosain, Z., Nagarajan, R., Godart, C., Chak, S. K., Gupta, L. C., Padalia, B. D., Vijayaraghavan, R.

Source: IIT Bombay

Content Type: Text

Publisher: AMER INST PHYSICS

File Format: HTM / HTML

Language: English

Subject Keyword: osrur3

Abstract: SmRuSn3 is a unique compound among the known Sm-based valence fluctuation (VF) systems. Its crystallographic structure has two inequivalent Sm sites and Sn ions at only one of them are in VF state while the Sn ions in the other site orders magnetically. Our (119)Mossbauer studies show a quadrupolar splitting at the Sn site, consistent with the noncubic symmetry of the Sm site. A broadening of the Mossbauer spectrum is seen due to magnetic ordering of the material. The transferred hyperfine field at Sn site at 4.2 K is small. (C) 1996 American Institute of Physics.

Education Level: UG or PG

Learning Resource Type: Article
Transport, magnetic, and 119Sn Mössbauer studies on magnetically ordered valence fluctuating compound SmRuSn$_3$


Citation: J. Appl. Phys. 79, 6349 (1996); doi: 10.1063/1.361996
View online: http://dx.doi.org/10.1063/1.361996
View Table of Contents: http://jap.aip.org/resource/1/JAPIAU/V79/8
Published by the American Institute of Physics.

Related Articles
Valence fluctuation and electron–phonon coupling in La$_{68-x}$Ce$_x$Al$_{10}$Cu$_{20}$Co$_2$ ($x = 0, 34,$ and 68) metallic glasses
Intermediate valency of Eu in a cubic intermetallic compound Ce0.5Eu0.5Pd3
Interface and Mn valency effects in ferromagnetic insulating multilayers based on Mn and Ti oxide
J. Appl. Phys. 103, 07D129 (2008)
Charge states of strongly correlated 3d oxides: from typical insulator to unconventional electron–hole Bose liquid
The effect of mixed Mn valences on Li migration in LiMn$_2$O$_4$ spinel: A molecular dynamics study

Additional Information on J. Appl. Phys.
Refine Search (Educational Level) Page
Chapter Five

MAGNETISM AND MATTER
Browse (by Type) Page
NDL Mobile App

Available on

Android

And

iOS
The worth of a librarian should be gauged by his power of attracting and looking after such circles by acting as the intermediary of an intimacy of relationship between reader and the library. – Rabindranath Tagore
## Roles and Responsibilities

### Host Institution

- **IDR**
  - Support for Setting up IDR
  - Installation CD
  - Manual
  - Training
  - IDR Service, if needed
- **Metadata**
  - NDL Metadata Standard
  - Creation, Curation Workflow
- **User**
  - Institutional Registration for Nodal Person
  - Bulk Addition of Users
- **Ongoing Support**
  - Over email, phone
  - Hands-on at NDL, if needed

### Contributing or Participating Institution

- **IDR (CI only)**
  - Setup IDR in Institutional LAN
  - Register with OPENDOAR / ROADMAP
  - OAI-PMH compliance for harvesting
  - OAI-ORE compliance for full-text access
  - Allow external access & Update regularly
- **Content (CI only)**
  - Add Content
  - Encourage faculty, students, staff to contribute
  - Create and Curate Metadata
- **User**
  - Register as an Institution
  - Add users in bulk or send to NDL
- **Promote**
  - Organize Workshop
  - Identify and Integrate Source
Technology of NDL

METADATA ENGINEERING

USER INTERFACE & EXPERIENCE TRACKING
- Metadata Standard
- Metadata Acquisition
Metadata Standard

Source: http://courseweb.ischool.illinois.edu/~butler9/LIS501b/current.html
Metadata Standard

- **Metadata**
  - Is primarily **textual information** relating to Content
  - Includes information that enables users to identify, discover, search, browse, interpret, or manage Content
  - Includes **hyperlinks** that direct users to Content on the Source
  - May include an **expressive description** of the Content

- **Metadata Standard**
  - Defines **common understanding of the semantics** of the data
  - Ensures **correct and proper use** and interpretation of the data
  - Defined through a **set of fields, vocabs** (optional), and **instructions** for fill-up
NDL Metadata Design Challenges

- **Wide category of resources**
  - Generic metadata or domain specific?

- **Openness of repository**
  - Closed metadata standard may fail to describe a new resource

- **Scale is enormous**
  - Manual annotation is infeasible
  - Automatic annotation guided by crowd sourcing?
Metadata Requirements Specs

- **To describe any digital resource**
  - Generic content metadata
    - Contributor, Description, Language, Format etc.

- **To describe domain specific resources**
  - Educational content metadata
    - Educational level, ToC, Type of learning material etc.
  - Thesis metadata
    - Institution, advisor, degree, researcher
NDL Metadata Standard

- NDL Metadata Standard v 1.0 is an **Open Virtual Standard**

- Schema is categorized into three profiles:
  - **Generic Metadata:**
    - Describes general attributes of the contents
    - Adopted from [Dublin Core Metadata Standard](http://www.dublincore.org)
  - **Educational Metadata:**
    - Describes the educational attributes of the resources and helps in enumerating properties of the contents relevant to teaching-learning process
    - Adopted from [Learning Resource Metadata Initiative (LRMI)](http://www.lrmi.org)
  - **Thesis Metadata:**
    - Describes dissertation or thesis related metadata fields
    - Adopted from [Shodhganga Thesis Metadata Standard](http://shodhganga.in)
  - More profiles may be added in future

- Uses the **namespace of Dublin Core (dc.)**
Metadata Envelop

NDL Metadata

Dublin Core (generic)
- title
- subject
- type
- description
- language
- date
- author

LRMI (educational)
- board
- difficultyLevel
- typicalLT
- prerequisiteTopic
- typeofLM
- pedagogicObjective
- educationLevel

Shodhganga (thesis)
- researcher
- keyword
- advisor
- place
- department
- institution
- awarded
- degree
Metadata Acquisition
## Acquisition Scenarios

<table>
<thead>
<tr>
<th>Locate Content</th>
<th>Acquire Metadata</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Harvest Institutional IDRs</td>
<td></td>
</tr>
<tr>
<td>• Crawl Websites</td>
<td></td>
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<tr>
<td>• In Bulk – from Publishers</td>
<td></td>
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<tr>
<td>• Donated by Source</td>
<td></td>
</tr>
<tr>
<td>• Source-supported API</td>
<td></td>
</tr>
<tr>
<td>• ...</td>
<td></td>
</tr>
<tr>
<td>• Creation</td>
<td></td>
</tr>
<tr>
<td>• Manual</td>
<td></td>
</tr>
<tr>
<td>• Automated</td>
<td></td>
</tr>
<tr>
<td>• Translation</td>
<td></td>
</tr>
<tr>
<td>• Format</td>
<td></td>
</tr>
<tr>
<td>• Standard / Schema</td>
<td></td>
</tr>
<tr>
<td>• Curation</td>
<td></td>
</tr>
<tr>
<td>• Manual</td>
<td></td>
</tr>
<tr>
<td>• Assisted</td>
<td></td>
</tr>
<tr>
<td>• Ingestion</td>
<td></td>
</tr>
</tbody>
</table>
Challenges in Metadata Acquisition

- Different sources follow different norm in annotation
  - Automation of curation
- Errors in sourced data
  - Error listing
  - Manual curation
- Errors in manual annotation
  - Review step before actual submission in database
  - Manual curation
- Set up norm/guideline
  - Controlled vocabulary
Translation Issues

- Variation in Subject classification standards
  - Dewey Decimal Classification (DDC)
  - Library of Congress Classification (LCC)
  - Library of Congress Subject Headings (LCSH)

- Mapping terminology for different languages
  - Translate when equivalent terminology is present
  - Transliterate otherwise
NDL Metadata Extraction Toolkit

- Automated metadata extraction workflow
- Syntactic metadata extractor
  - Author name, ISBN, Publisher, dates etc.
- Table of content extractor
- Wikification for keyword extraction
- Learning resource metadata
- Toolchain for metadata extraction

Once completed and tested, the toolkit will be released to public and open-sourced
Experience Tracking and UI

- **Experience Tracking**
  - To offer customized search results

- **Multi-lingual Support**
  - Reduce cognitive load for native use

- **Personalization**
  - Customized UI to suit user grade

Experience API (xAPI) / Tin Can API

- Connects learning content and learning systems to record and track all types of learning experiences

Learning Record Store (LRS)

- Stores learning experiences

Infer:

- Partha learnt – tiger is the national animal (of India)
- ... possibly
UI Technology:
Web Interface

API End Points:

- RestFul API endpoint
- CMS API, Index API and LMS API
- Parameterized access to the index

API Sandbox

- Web interface is an app using NDL API
- Extended Search Features
  - Facet based search result refinement
  - DDC Topic tree based content browsing
  - Tag, comment on a content
  - Target group specific interface
  - Bookshelf
  - Rating and sharing
- NDL-Specific Features
  - Multi-lingual enablement
    - Multi-lingual query interface powered by Google transliteration
    - Cross-lingual search
  - Personalization
HOW DOES NDL COPE WITH COPYRIGHT AND LICENSING ISSUES
Copyright Act, 1957 (Amendment 2012)

Is metadata copyrighted?

Yes / No / May be

Copyright of Metadata is contested

Source:
http://lj.libraryjournal.com/2013/02/opinion/peer-to-peer-review/metadata-and-copyright-peer-to-peer-review/

• Copyright is a bundle of rights given by the law to
  ○ Creators of literary, dramatic, musical and artistic works and
  ○ Producers of cinematograph films and sound recordings

• Rights are:
  ○ reproduction of the work,
  ○ communication of the work to the public,
  ○ adaptation of the work and,
  ○ translation of the work

• Creator / Author is the first Owner

• Ownership (Title) can be transferred (assigned)
• NDL principles as follows:
  ○ Vast Majority of Metadata is Not Subject to Copyright Restrictions
  ○ NDL’s Partners Share the NDL’s Commitment
  ○ NDL Asserts No Rights Over its Database of Metadata and Dedicates its Contributions to the Public Domain
  ○ Free and Unencumbered Access to Metadata

License Mechanisms

- Content Access Views in NDL
  - Metadata View
    - This shows the metadata of the item – as maintained in NDL
  - Full Text View
    - This shows the view and provides access to full text – offered by the content source

A license encapsulates the rights & privileges that a copyright holder grants to someone else vis–a–vis something they have created
Content Access View: Metadata

Source Page is rendered within NDL showing free Metadata

IIT, Kharagpur
Transport, magnetic, and Sn-119 Mossbauer studies on magnetically ordered valence fluctuating compound SmRuSn3

Show full item record

Title: Transport, magnetic, and Sn-119 Mossbauer studies on magnetically ordered valence fluctuating compound SmRuSn3

Author: MAZUMDAR, C; MOSSAIN, Z; NAGARAJAN, R; GODART, C; DHAR, SK; GUPTA, LC; PALADIL, BD; VILAPARAGHAN, R

SmRuSn3 is a unique compound among the known Sm-based valence fluctuation (VF) systems. Its crystallographic structure has two inequivalent Sm sites and Sm ions at only one of them are in VF state while the Sm ions in the other site orders magnetically. Our (119)Mossbauer studies show a quadrupolar splitting at the Sm site, consistent with the nongeneric symmetry of the Sm site. A broadening of the Mossbauer spectrum is seen due to magnetic ordering of the material. The transferred hyperfine field at Sm site at 4.2 K is small. (C) 1996 American Institute of Physics.

Abstract: Transport, magnetic, and Sn-119 Mossbauer studies on magnetically ordered valence fluctuating compound SmRuSn3

URL: http://dx.doi.org/10.1063/1.361996
http://dspace.library.iitb.ac.in/xmlui/handle/10088/14612
http://dl.handle.net/100/1461
## Access Options

<table>
<thead>
<tr>
<th>Access Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Open</strong></td>
<td>Full-text available to all (Example: NCERT)</td>
</tr>
<tr>
<td><strong>NDL Users</strong></td>
<td>Full-text available through NDL, <em>not directly</em> from Source (Example: South Asia Archive)</td>
</tr>
<tr>
<td><strong>Limited Access</strong></td>
<td>Part of text available but full-text requires authorization by Source authority (Example: IISER, Bhopal)</td>
</tr>
<tr>
<td><strong>Subscribed</strong></td>
<td>Full-text available from institutions that have subscribed to the Source (Example: Springer)</td>
</tr>
<tr>
<td><strong>Restricted</strong></td>
<td>Full-text access requires authorization by Source authority and separate login to the Source (Example: IIT Jodhpur)</td>
</tr>
</tbody>
</table>
National Licensing

• An initiative by eSS:
  - e-ShodhSindhu: Consortium for Higher Education Electronic Resources

• Licensing being negotiated with Publishers
  - Institutional License:
    - Accessible from within designated institutional network: IP filtered
  - NDL Supported License:
    - Accessible if requested from NDL: Concurrent use-basis
Completed:
Events: 25
Institutes: 730
Individuals: 1340

Scheduled:
Events: 2
Institutes: 60
Individuals: 140
NDLI Live:
https://ndl.iitkgp.ac.in/

NDLI on Facebook:
https://web.facebook.com/NDLIndia/

NDLI on YouTube:
https://www.youtube.com/watch?v=LEwAyHGKeLw
https://www.youtube.com/watch?v=qIZB-G9ywFo
https://www.youtube.com/watch?v=UCoJwfPrQFs&t=115s

NDLI Project:
http://www.ndlproject.iitkgp.ac.in/ndl/
Publications

1. Debarshi Kumar Sanyal, *Semantic Search in Digital Library*, Presented in International Seminar on Digital Humanities and Digital Societies in the Contemporary World, January 18-19, 2018


Status ...

- Items: 16M+
- Metadata: Version 1.0 of Standard Published
- Sources: 164 (IDRs: 100+)
- Registered Users: 3.0M+
- Daily Website Hits: ~12K
- Android App Download: 8L+
- Daily Android / iOS Hits: ~10K
- Registered User Institutions: ~9K
- Languages: 20+
- Learning Resource type: 15+
- Subject domain:
  - Most of the major educational areas (except medical and law)
- Educational Level: School Level (Class-I to XII) , UG and PG
Status …

- **Nature of Sources: 154 (IDRs: 100+)**
  - Featured: 7
    - Shodhganga, Shodhgangotri, Spoken Tutorial, SNLTR, OECD, Satyajit Ray Archives, JEE / GATE Questions & Solutions, South Asia Archives, WeL
  - Crawled Repositories: 5
    - NPTEL, Khan Academy, PhET, Project-OSCAR, LibriVox (audio books), PubMed
  - Manually-annotated sources: 6
    - NCERT, CBSE, Boards of WB, Tripura, AP, Karnataka, Kerala, Maharashtra
  - MARC data from Publishers: 2
    - CRC Press, Springer
  - Through API: 1
    - INFLIBNET N-LIST

- **Upcoming**
  - Integration Underway
    - Royal Society of Chemistry
    - American Society of Mechanical Engineers
  - Exploration
    - UNESCO, Gandhi Heritage Portal

IIT, Kharagpur
Summary

The only thing that you absolutely have to know (may use Google, though), is the URL of NDL:

ndl.iitkgp.ac.in

Rest you find in NDL

Why are you waiting?

An umbrella over all IRs of India

User-Centric Design
  - Multi-lingual Indic Interface
  - Multi-faceted Search
  - Multi-modal Filters
  - User Experience Tracking for Personalization

Rich Set of Contents
  - National Licensing
  - Domain / Usage -focused Verticals

Metadata Engineering
  - Metadata Standard
  - Open Source Toolkit

NDLServices
  - Open APIs for 3rd party development

Platform for Educational Ecosystem where all stakeholders participate, contribute and benefit

Spearheads NDL Movement