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PI/PD Name: Gerd Kortemeyer

Gender: ☒ Male ☐ Female

Ethnicity: (Choose one response) ☐ Hispanic or Latino ☒ Not Hispanic or Latino

Race: (Select one or more)
- ☐ American Indian or Alaska Native
- ☐ Asian
- ☐ Black or African American
- ☐ Native Hawaiian or Other Pacific Islander
- ☒ White

Disability Status: (Select one or more)
- ☐ Hearing Impairment
- ☐ Visual Impairment
- ☐ Mobility/Orthopedic Impairment
- ☐ Other
- ☒ None

Citizenship: (Choose one) ☐ U.S. Citizen ☒ Permanent Resident ☐ Other non-U.S. Citizen

Check here if you do not wish to provide any or all of the above information (excluding PI/PD name): ☒

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PI/PD Name: Edwin Kashy

Gender: ☒ Male ☐ Female

Ethnicity: (Choose one response) ☐ Hispanic or Latino ☒ Not Hispanic or Latino

Race: (Select one or more)
- ☐ American Indian or Alaska Native
- ☐ Asian
- ☐ Black or African American
- ☐ Native Hawaiian or Other Pacific Islander
- ☒ White

Disability Status: (Select one or more)
- ☐ Hearing Impairment
- ☐ Visual Impairment
- ☐ Mobility/Orthopedic Impairment
- ☐ Other
- ☐ None

Citizenship: (Choose one) ☒ U.S. Citizen ☐ Permanent Resident ☐ Other non-U.S. Citizen

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PI/PD Name: Thomas Krichel

Gender: ☐ Male ☐ Female

Ethnicity: (Choose one response) ☐ Hispanic or Latino ☐ Not Hispanic or Latino

Race: (Select one or more)
- ☐ American Indian or Alaska Native
- ☐ Asian
- ☐ Black or African American
- ☐ Native Hawaiian or Other Pacific Islander
- ☐ White

Disability Status: (Select one or more)
- ☐ Hearing Impairment
- ☐ Visual Impairment
- ☐ Mobility/Orthopedic Impairment
- ☐ Other
- ☐ None

Citizenship: (Choose one) ☐ U.S. Citizen ☐ Permanent Resident ☐ Other non-U.S. Citizen

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PI/PD Name: Michael S Seadle

Gender: ☒ Male ☐ Female

Ethnicity: (Choose one response) ☐ Hispanic or Latino ☒ Not Hispanic or Latino

Race: (Select one or more)
- ☐ American Indian or Alaska Native
- ☐ Asian
- ☐ Black or African American
- ☐ Native Hawaiian or Other Pacific Islander
- ☒ White

Disability Status: (Select one or more)
- ☐ Hearing Impairment
- ☐ Visual Impairment
- ☐ Mobility/Orthopedic Impairment
- ☐ Other
- ☐ None

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PI/PD Name: Eberhard R Hilf

Gender: ☒ Male ☐ Female

Ethnicity: (Choose one response) ☐ Hispanic or Latino ☐ Not Hispanic or Latino

Race: (Select one or more)
- ☐ American Indian or Alaska Native
- ☐ Asian
- ☐ Black or African American
- ☐ Native Hawaiian or Other Pacific Islander
- ☒ White

Disability Status: (Select one or more)
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- ☐ Visual Impairment
- ☐ Mobility/Orthopedic Impairment
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- ☒ None

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PI/PD Name: Christoph Schick

Gender: ☐ Male ☐ Female

Ethnicity: (Choose one response) ☐ Hispanic or Latino ☐ Not Hispanic or Latino

Race: (Select one or more)
- ☐ American Indian or Alaska Native
- ☐ Asian
- ☐ Black or African American
- ☐ Native Hawaiian or Other Pacific Islander
- ☐ White

Disability Status: (Select one or more)
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- ☐ Visual Impairment
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- ☐ None

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List of Suggested Reviewers or Reviewers Not To Include (optional)

SUGGESTED REVIEWERS:
Not Listed

REVIEWERS NOT TO INCLUDE:
Not Listed

List of Suggested Reviewers or Reviewers Not To Include (optional)

SUGGESTED REVIEWERS:
Not Listed

REVIEWERS NOT TO INCLUDE:
Not Listed

List of Suggested Reviewers or Reviewers Not To Include (optional)

SUGGESTED REVIEWERS:
Not Listed

REVIEWERS NOT TO INCLUDE:
Not Listed

COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

PROGRAM ANNOUNCEMENT/SOLICITATION NO./CLOSING DATE/if not in response to a program announcement/solicitation enter NSF 02-2

NSF 02-085 **04/15/03**

FOR CONSIDERATION BY NSF ORGANIZATION UNIT(S) (Indicate the most specific unit known, i.e. program, division, etc.)

IIS - SPECIAL PROJECTS (IIS)

FOR NSF USE ONLY

NSF PROPOSAL NUMBER

0240171

DATE RECEIVED	NUMBER OF COPIES	DIVISION ASSIGNED	FUND CODE	DUNS# (Data Universal Numbering System)	FILE LOCATION
				053343976	

EMPLOYER IDENTIFICATION NUMBER (EIN) OR TAXPAYER IDENTIFICATION NUMBER (TIN)

386005984

SHOW PREVIOUS AWARD NO. IF THIS IS
☐ A RENEWAL
☐ AN ACCOMPLISHMENT-BASED RENEWAL

IS THIS PROPOSAL BEING SUBMITTED TO ANOTHER FEDERAL AGENCY? YES ☐ NO ☒ IF YES, LIST ACRONYM(S)

NAME OF ORGANIZATION TO WHICH AWARD SHOULD BE MADE

Michigan State University

AWARDEE ORGANIZATION CODE (IF KNOWN)

0022905000

ADDRESS OF AWARDEE ORGANIZATION, INCLUDING 9 DIGIT ZIP CODE

Michigan State University
Contracts & Grants Department
East Lansing, MI. 488241046

NAME OF PERFORMING ORGANIZATION, IF DIFFERENT FROM ABOVE

PERFORMING ORGANIZATION CODE (IF KNOWN)

ADDRESS OF PERFORMING ORGANIZATION, IF DIFFERENT, INCLUDING 9 DIGIT ZIP CODE

IS AWARDEE ORGANIZATION (Check All That Apply)
(See GPG II.C For Definitions) ☐ FOR-PROFIT ORGANIZATION ☐ SMALL BUSINESS ☐ MINORITY BUSINESS ☐ WOMAN-OWNED BUSINESS

TITLE OF PROPOSED PROJECT **International Digital Library Interoperability for Physics E-learning Objects**

REQUESTED AMOUNT	PROPOSED DURATION (1-60 MONTHS)	REQUESTED STARTING DATE	SHOW RELATED PREPROPOSAL NO., IF APPLICABLE
$ **571,411**	**36** months	**01/01/02**	

CHECK APPROPRIATE BOX(ES) IF THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW

☐ BEGINNING INVESTIGATOR (GPG I.A)
☐ DISCLOSURE OF LOBBYING ACTIVITIES (GPG II.C)
☐ PROPRIETARY & PRIVILEGED INFORMATION (GPG I.B, II.C.6)
☐ HISTORIC PLACES (GPG II.C.9)
☐ SMALL GRANT FOR EXPLOR. RESEARCH (SGER) (GPG II.C.11)
☐ VERTEBRATE ANIMALS (GPG II.C.11) IACUC App. Date _____
☒ HUMAN SUBJECTS (GPG II.C.11)
Exemption Subsection _____ or IRB App. Date **07/30/02**
☐ INTERNATIONAL COOPERATIVE ACTIVITIES: COUNTRY/COUNTRIES INVOLVED (GPG II.C.9)
☐ HIGH RESOLUTION GRAPHICS/OTHER GRAPHICS WHERE EXACT COLOR REPRESENTATION IS REQUIRED FOR PROPER INTERPRETATION (GPG I.E.1)

PI/PD DEPARTMENT
Division of Science & Mathematics Educ

PI/PD FAX NUMBER
517-432-5653

PI/PD POSTAL ADDRESS
123 North Kedzie
Michigan State University
East Lansing, MI 48824
United States

NAMES (TYPED)	High Degree	Yr of Degree	Telephone Number	Electronic Mail Address
PI/PD NAME **Gerd Kortemeyer**	**PhD**	**1997**	**517-432-5468**	**korte@lite.msu.edu**
CO-PI/PD **Edwin Kashy**	**Ph.D.**	**1959**	**517-333-6318**	**kashy@nscl.msu.edu**
CO-PI/PD **Thomas Krichel**	**PhD**	**1999**	**516-299-2527**	**krichel@openlib.org**
CO-PI/PD **Michael S Seadle**	**Ph.D**	**1977**	**517-432-0807**	**seadle@msu.edu**
CO-PI/PD				

Electronic Signature

CERTIFICATION PAGE

Certification for Authorized Organizational Representative or Individual Applicant:

By signing and submitting this proposal, the individual applicant or the authorized official of the applicant institution is: (1) certifying that statements made herein are true and complete to the best of his/her knowledge; and (2) agreeing to accept the obligation to comply with NSF award terms and conditions if an award is made as a result of this application. Further, the applicant is hereby providing certifications regarding debarment and suspension, drug-free workplace, and lobbying activities (see below), as set forth in Grant Proposal Guide (GPG), NSF 02-2. Willful provision of false information in this application and its supporting documents or in reports required under an ensuing award is a criminal offense (U. S. Code, Title 18, Section 1001).

In addition, if the applicant institution employs more than fifty persons, the authorized official of the applicant institution is certifying that the institution has implemented a written and enforced conflict of interest policy that is consistent with the provisions of Grant Policy Manual Section 510; that to the best of his/her knowledge, all financial disclosures required by that conflict of interest policy have been made; and that all identified conflicts of interest will have been satisfactorily managed, reduced or eliminated prior to the institution's expenditure of any funds under the award, in accordance with the institution's conflict of interest policy. Conflicts which cannot be satisfactorily managed, reduced or eliminated must be disclosed to NSF.

Drug Free Work Place Certification

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative or Individual Applicant is providing the Drug Free Work Place Certification contained in Appendix A of the Grant Proposal Guide.

Debarment and Suspension Certification

(If answer "yes", please provide explanation.)

Is the organization or its principals presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency? Yes ☐ No ☒

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative or Individual Applicant is providing the Debarment and Suspension Certification contained in Appendix B of the Grant Proposal Guide.

Certification Regarding Lobbying

This certification is required for an award of a Federal contract, grant, or cooperative agreement exceeding $100,000 and for an award of a Federal loan or a commitment providing for the United States to insure or guarantee a loan exceeding $150,000.

Certification for Contracts, Grants, Loans and Cooperative Agreements

The undersigned certifies, to the best of his or her knowledge and belief, that:

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AUTHORIZED ORGANIZATIONAL REPRESENTATIVE	SIGNATURE	DATE
NAME **Craig E ONeill**	**Electronic Signature**	**Jul 30 2002 3:39PM**

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COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

PROGRAM ANNOUNCEMENT/SOLICITATION NO./CLOSING DATE/if not in response to a program announcement/solicitation enter NSF 02-2

NSF 02-085 **04/15/03**

FOR CONSIDERATION BY NSF ORGANIZATION UNIT(S) (Indicate the most specific unit known, i.e. program, division, etc.)

IIS - SPECIAL PROJECTS (IIS)

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NAME OF ORGANIZATION TO WHICH AWARD SHOULD BE MADE

Uniersitat Oldenburg

AWARDEE ORGANIZATION CODE (IF KNOWN)

5300008847

ADDRESS OF AWARDEE ORGANIZATION, INCLUDING 9 DIGIT ZIP CODE

26111 Oldenburg Germany
Germany, GE 00000

NAME OF PERFORMING ORGANIZATION, IF DIFFERENT FROM ABOVE

PERFORMING ORGANIZATION CODE (IF KNOWN)

ADDRESS OF PERFORMING ORGANIZATION, IF DIFFERENT, INCLUDING 9 DIGIT ZIP CODE

IS AWARDEE ORGANIZATION (Check All That Apply)
(See GPG II.C For Definitions) ☐ FOR-PROFIT ORGANIZATION ☐ SMALL BUSINESS ☐ MINORITY BUSINESS ☐ WOMAN-OWNED BUSINESS

TITLE OF PROPOSED PROJECT **International Digital Library Interoperability for Physics E-learning Objects**

REQUESTED AMOUNT	PROPOSED DURATION (1-60 MONTHS)	REQUESTED STARTING DATE	SHOW RELATED PREPROPOSAL NO., IF APPLICABLE
$ **150,150**	**36** months	**01/01/03**	

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☐ SMALL GRANT FOR EXPLOR. RESEARCH (SGER) (GPG II.C.11)
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Exemption Subsection _____ or IRB App. Date _____
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_____
☐ HIGH RESOLUTION GRAPHICS/OTHER GRAPHICS WHERE EXACT COLOR REPRESENTATION IS REQUIRED FOR PROPER INTERPRETATION (GPG I.E.1)

PI/PD DEPARTMENT
Physics Department; Oldenburg University

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CO-PI/PD				
CO-PI/PD				
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CERTIFICATION PAGE

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By signing and submitting this proposal, the individual applicant or the authorized official of the applicant institution is: (1) certifying that statements made herein are true and complete to the best of his/her knowledge; and (2) agreeing to accept the obligation to comply with NSF award terms and conditions if an award is made as a result of this application. Further, the applicant is hereby providing certifications regarding debarment and suspension, drug-free workplace, and lobbying activities (see below), as set forth in Grant Proposal Guide (GPG), NSF 02-2. Willful provision of false information in this application and its supporting documents or in reports required under an ensuing award is a criminal offense (U. S. Code, Title 18, Section 1001).

In addition, if the applicant institution employs more than fifty persons, the authorized official of the applicant institution is certifying that the institution has implemented a written and enforced conflict of interest policy that is consistent with the provisions of Grant Policy Manual Section 510; that to the best of his/her knowledge, all financial disclosures required by that conflict of interest policy have been made; and that all identified conflicts of interest will have been satisfactorily managed, reduced or eliminated prior to the institution's expenditure of any funds under the award, in accordance with the institution's conflict of interest policy. Conflicts which cannot be satisfactorily managed, reduced or eliminated must be disclosed to NSF.

Drug Free Work Place Certification

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Debarment and Suspension Certification

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Is the organization or its principals presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency? Yes ☐ No ☒

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AUTHORIZED ORGANIZATIONAL REPRESENTATIVE	SIGNATURE	DATE
NAME **Julika Mimkes**	**Electronic Signature**	**Jul 30 2002 2:27PM**

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441-798-2742	**mimkes@uni-oldenburg.de**	**441-798-5851**

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NSF 02-085 **04/15/03**

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Universitat Rostock

AWARDEE ORGANIZATION CODE (IF KNOWN)

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TITLE OF PROPOSED PROJECT **International Digital Library Interoperability for Physics E-learning Objects**

REQUESTED AMOUNT	PROPOSED DURATION (1-60 MONTHS)	REQUESTED STARTING DATE	SHOW RELATED PREPROPOSAL NO., IF APPLICABLE
$ **183,000**	**36** months	**01/01/03**	

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PI/PD DEPARTMENT
Physik

PI/PD FAX NUMBER
381-498-1626

PI/PD POSTAL ADDRESS
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Universitatsplatz 3
Rostock,
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NAMES (TYPED)	High Degree	Yr of Degree	Telephone Number	Electronic Mail Address
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CERTIFICATION PAGE

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AUTHORIZED ORGANIZATIONAL REPRESENTATIVE	SIGNATURE	DATE
NAME **Christoph Schick**	**Electronic Signature**	**Jul 29 2002 3:56PM**

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Project Summary

The creation of *effective* electronic learning content and functionality ("elearning objects") is a costly task, and usually cannot nor should be undertaken by a single institution. Compared to scientific documents, however, elearning objects are much more diverse in type, size, format, interaction, clientele, language, purpose, licenses, author-status, and additional processing demands. This causes problems of incompatibility between different systems and countries, so that interoperability is not easy to achieve. However, once it *is* achieved, due to the diversity and sheer number of the available elearning objects, finding appropriate resources for a specific teaching situation becomes increasingly challenging.

To address some of these challenges, as testing ground, we will start by connecting the databases and platforms at Michigan State University East Lansing (MSU; LON-CAPA) and Carl von Ossietzky Universität Oldenburg (UOl; physik multimedial (PMM), Links zu Lerninhalten der Physik (LiLi)), which both within larger collaborations cover physics elearning objects.

We plan to identify the impediments to efficient exchange of educational materials, and achieve a sufficient level of interoperability between these two educational digital library systems, and then design, build, explore, and set up enhanced 'aggregated' services to enable intelligent retrieval for elearning objects.

The goals are

1. to achieve interoperability between LON-CAPA on the one side, and PMM/LiLi on the other. Issues are
   - technical interoperability
   - different approaches to teaching ("social interoperability")
   - copyright, right of use issues ("legal interoperability")
2. to provide aggregated search and retrieval mechanisms for the combined system,
3. work toward the development of a shareable elearning environment,
4. to make much of that material available to the public at large, subject to appropriate copyrights.

The final result should be prototypes of services to be served by the university libraries to the public, as well as a sufficient level of interoperability between the LON-CAPA and PMM/LiLi systems to exchange content.

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For font size and page formatting specifications, see GPG section II.C.

*Proposers may select any numbering mechanism for the proposal. The entire proposal however, must be paginated. Complete both columns only if the proposal is numbered consecutively.

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TABLE OF CONTENTS

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Section		Total No. of Pages in Section	Page No.* (Optional)*
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A	Project Summary (not to exceed 1 page)	1	
B	Table of Contents	1	
C	Project Description (Including Results from Prior NSF Support) (not to exceed 15 pages) **(Exceed only if allowed by a specific program announcement/solicitation or if approved in advance by the appropriate NSF Assistant Director or designee)**	15	
D	References Cited	2	
E	Biographical Sketches (Not to exceed 2 pages each)	2	
F	Budget (Plus up to 3 pages of budget justification)	5	
G	Current and Pending Support	1	
H	Facilities, Equipment and Other Resources	1	
I	Special Information/Supplementary Documentation	5	
J	Appendix (List below.) **(Include only if allowed by a specific program announcement/ solicitation or if approved in advance by the appropriate NSF Assistant Director or designee)**		
	Appendix Items:		

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Project Description

1 Project Overview

It has been shown that information technology (IT) can be used to enhance learning and performance. For example, for engineering physics, broad use of IT has been made for prompt feedback on homework, for use of examination as formative assessment, for preparation and grading of quizzes, for keeping students abreast of the material, and for providing an effective communication tool among students and between students and instructor. However, this *effective* use of IT requires a considerable amount of high quality content, which has to be thoroughly tested for accuracy and effectiveness [1].

The creation of such electronic learning content and functionality ("elearning objects") is a costly task, and usually cannot nor should be undertaken by a single institution — just like the creation of scientific research knowledge and documents is not undertaken in isolation [2]. Compared to scientific documents, however, elearning objects are much more diverse in type, size, format, interaction, clientele, language, purpose, licenses, author-status, and additional processing demands. This causes problems of incompatibility between different systems and countries, so that interoperability is not easy to achieve. However, once it *is* achieved, due to the diversity and sheer number of the available elearning objects, finding appropriate resources for a specific teaching situation becomes increasingly challenging.

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Many of the above mentioned challenges are exemplified in these two systems, since they represent two sophisticated but currently independent web-based learning content and course management systems, whose individual designs are at the forefront of today's IT use in education.

In summary, we plan to identify the impediments to efficient exchange of educational materials, and achieve a sufficient level of interoperability between these two educational digital library systems, and then design, build, explore, and set up enhanced 'aggregated' services to enable intelligent retrieval for elearning objects.

The goals are

1. to achieve interoperability between LON-CAPA on the one side, and PMM/LiLi on the other. Issues are
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3. work toward the development of a shareable elearning environment,

0240171

4. to make much of that material available to the public at large, subject to appropriate copyrights.

The final result should be prototypes of services to be served by the university libraries to the public, as well as a sufficient level of interoperability between the LON-CAPA and PMM/LiLi systems to exchange content.

2 Relevant Previous and Current Projects of the Collaborators

2.1 CAPA

In the fall of 1992, CAPA (a Computer-Assisted Personalized Approach) was piloted in a small physics class of 92 students. CAPA provides students with personalized problem sets, quizzes, and exams [3-5]. Students are given instant feedback and hints via the internet and may correct errors without penalty until the assignment due date. The system records the students' participation and performance and the records are available online to both the instructor and the individual student. CAPA is a teaching tool, not a curriculum, and as such does not dictate course design, content, or goals. Instead, it enables faculty to augment their courses with individualized relevant exercises.

CAPA received funding from the Sloan and Mellon foundations, and has been widely adopted. Since 1992, CAPA has been used by more than 100,000 students in astronomy, biochemistry, chemistry, mathematics, physics, statistics, botany, accelerator physics, and a host of human ecology and computer science courses. CAPA has been licensed by over 50 institutions for instruction in several disciplines.

2.2 Lecture*Online*

Lecture*Online* was started in an effort to provide CAPA-style individualized homework, elearning content, and course management tools within the same platform [2].

Lecture*Online* started with 770 students in a physics class in the fall of 1997, and has since been used by more than 10,000 students from four different institutions in physics, chemistry, food science, medical technology, biology and geology. Lecture*Online*'s further development was funded in part by the National Science Foundation and the Howard Hughes Medical Institute, and the system recently became a centrally supported MSU computer service.

2.3 MultiMedia Physics

In 1993 the MultiMedia Physics project was launched with funding from the NSF's Instrumentation and Laboratory Improvement (ILI) initiative as well as funding from a Presidential Faculty Fellow Award. This project produced an integrated sequence of laboratory/lecture/recitation modules for the introductory physics curriculum. It was based on multimedia authoring software and published two CDs [6,7], and in 1997 also ported to Lecture*Online*, where it was used by several courses in different instructional settings at five higher education institutions.

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2.4 ITR Project LON-CAPA

The Learning*Online* Network with a Computer Assisted Personalized Approach (LON-CAPA, [8,9]) is an integrated Learning Content Management and Assessment System initially developed at Michigan State University.

With its current functionality, it provides instructors with a common, scalable platform to assist in all aspects of teaching a course, from lecture preparation to administration of homework assignments, and exams. It allows instructors to create educational materials, and to combine their own and other instructors' content into adaptive curricular units at different levels of granularity.

In addition, LON-CAPA provides a sophisticated assignment engine that can create unique homework assignments and examinations for each student in a class. Its formative and summative assessment tools grade a broad variety of objective problems and assist in the evaluation of essays.

It provides prompt feedback for students and instructors, as well as statistical information on performance and on effectiveness of materials. Discussion pages attached to every homework assignment encourage communication among students and faculty.

The LON-CAPA software is freely available and free (GNU General Public License), and may be modified and adapted using the same license under which the Linux operating system is covered. While LON-CAPA and its predecessors are currently used by more than 10,000 students/semester at MSU alone, LON-CAPA is adopted at the rate of about one additional institution per month, and the dissemination and use of the system is supported by regular workshops and conferences.

LON-CAPA is also the model system for a five-year NSF ITR research project, NSF-ITR 0085921 (5 year, $2.055M, Gerd Kortemeyer, PI). Over the coming four years with support by the National Science Foundation, we plan to transform this system beyond the boundaries of MSU's campus into a dynamic online collaborative community of faculty authors, commercial publishers, and learners. Through an RET supplement, we have in the past two years gained eight high school teachers as collaborators in this effort, who are currently using LON-CAPA in their classrooms.

The ITR grant does not fund the software development of LON-CAPA. Instead, LON-CAPA is the model system for community building and sustainability efforts around online educational resources, research on criteria for resource effectiveness, and research on data mining and learner adaptivity.

2.5 Cross-Integration Supplement of LON-CAPA and the NSDL

The purpose of an already-funded ITR supplement is to integrate the library layer of the LearningOnlineNetwork with CAPA (LON-CAPA; the model system of the ITR project) into the National STEM Education Digital Library (NSDL, [10]), and vice versa. This will be accomplished by the creation of a gateway server, which will make the resource pool of LON-CAPA appear like a federated library system of the NSDL in one direction, and NSDL like a LON-CAPA domain in the other.

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This transparent gateway will allow users of the NSDL portal to access the distributed inter-institutional resource pool of LON-CAPA like any other federated library system. By the same token, it will also allow any educator participating in LON-CAPA to seamlessly integrate any resource within the NSDL into their virtual course packs, and use these in their instruction.

As a member of SMETE.org [11], the LON-CAPA group, under the direction of Gerd Kortemeyer, carries out the supplement together with the Berkeley group of SMETE.org.

With this gateway in place, LON-CAPA can be used as a course and learning content management system, as well as learning outcome assessment system, for NSDL content.

2.6 physik multimedial

In Germany the project "physik multimedial" (PMM, [12]) funded by the German Ministry of Education and Research (3 years, Euro 2M), is aimed at students who study physics as a minor, and who major in a broad variety of disciplines. Eight groups at five universities in Northern Germany have formed a collaboration to create teaching and learning modules. Three different kinds of modules are being developed:

1. Self-study units for students with physics content related to their individual majors and needs.

2. Refereed collections of distributed physics content with which faculty are able to improve their lectures by showing for example virtual laboratories and simulations in class.

3. Exercise modules for personalized homework and self-testing.

The project started in April 2001. The exercise module has been used in classes since fall 2001 and the self-study units have been evaluated in pilot studies. In fall 2002 the modules of "physik multimedial" are integrated in the platform "Campus Virtuell" [13] to serve classes.

2.7 LiLi

"LiLi - Links zu Lerninhalten der Physik" [14] is part of physik multimedial. This database contains links to online physics material and related descriptions, comments, ratings and exercises. Comments can be inscribed by the person who enters the link to LiLi, by physicists, and by ordinary users of LiLi; the comments of these three groups are visually separated in the output. The categories of the descriptions are mainly based on Learning Object Metadata (LOM; [15]), completed with some additional proprietary metadata to gain a set of metadata that serve the needs of the project. Up to now, about 150 links have been entered to LiLi. This summer, LiLi is being integrated into the modules of physik multimedial.

2.8 RePEc

RePEc is a digital superarchive that operates as an academic self-documentation clearinghouse. The organizers of the project can soon look back on 10 years of

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experience in collecting a free academic distributed database. RePEc is the largest decentralized academic digital library in the world. It has pioneered the distinction between data providers and service providers. Over 250 data providers contribute to the collection. Around 10 different service providers are using the data. It once was given a subsidy of (GBP 129,000) but runs on volunteer power. The key to its operations is a set of incentives that make academics furnish free data and labor to the collection.

2.9 PhysNet

PhysNet is a service in close analogy to RePEc but developed independently and for another field and in another context. PhysNet basically serves link-lists of all Physics Institutions and Departments worldwide for home pages, their scientific documents, elearning material, etc. plus a search engine system. Technically it is based on an international web of distributed HARVEST gatherers and HARVEST brokers [16]. PhysNet is served by the European Physical Society and with official national partner societies in many countries worldwide.

PhysDoc, the document database of PhysNet, serves also an OAI compliant data provider which includes metadata of documents distributed at physics institutions, all papers of the Institute of Physics Publishing Ltd of the British Physical Society journals (about 140,000), and a large part of the eprint ArXiv of Cornell University for physics and adjacent fields.

3 Technical Interoperability Challenges

To integrate the Digital Library systems of LON-CAPA on the one side, and PMM and LiLi on the other side, several technical challenges have to be met. Since the platform of PMM, (Campus Virtuell, [13]) is currently being implemented, and some of the tools are not yet finished, only preliminary information can be given today.

3.1 Resource Rendering

LON-CAPA: The majority of LON-CAPA resources, in particular online homework and quizzes, are stored in a combined LaTeX/XML/Perl-format, which is server-side rendered on-the-fly for web browsing and print, as well as for pseudo-targets such as editing, grading, and cataloging. Besides different generated presentation documents for different targets, the rendering is further controlled by the session environment, course-wide style files, user role, conditionals, and current state ("attempted", "solved", etc).
PMM/LiLi: The modules of PMM are stored in html format on the server of the author (self-study units) or in a MySQL database (exercises). It is planned that each student is going to have a certain private space on the platform of the project for his/her personal settings and notes.

3.2 One-Source for Multilingual Rendering

For the majority of physics resources, there will be a significant overlap between renderings in different languages, e.g., German and English. For example, formulas in content pages, script blocks in exercises, etc, will remain unchanged,

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while the actual text differs.
LON-CAPA: Within the current LON-CAPA framework, such language-dependent rendering could currently be implemented using conditional blocks within the XML structure, yet there is no way for educators in the respective other country to easily add a translation to an existing resource by another author.
PMM/LiLi: While it is planned to translate LiLi into English, it is a bigger goal to translate the self-study units. The database for exercise modules allows parallel handling of multi-lingual versions of exercises. Using conditions, the platform "Campus Virtuell" could display the content in a selected language.

3.3 Authentication

LON-CAPA: In the center of LON-CAPA's architecture is the user, who can be assigned roles with a variety of privileges, including those to browse certain resources.
PMM/LiLi: In "Campus Virtuell" no certain privilege is needed to browse LiLi and the self-study units. Teachers also have the right to open courses and assign students to them. They also have full rights to use the exercise module.

3.4 Learner Performance Data Storage

LON-CAPA: When a LON-CAPA resource is published (cataloged), part of the metadata that is gathered are the export data from each XML tag. When the resource is rendered for target "grading," these will be the data items that the resource expects to be able to write into the platform's database infrastructure for later retrieval either by itself or by grading tools such as the built-in spreadsheet.
PMM/LiLi: The access of self-study units is stored in "Campus Virtuell". The students' response on the personalized exercises is stored in the MySQL database and compared with the correct solution of the problem. The grading of exercises is supported by the system but is stored outside the system.

3.5 External Resource Parameters

LON-CAPA: In the same way that a resource publishes its own export data description, it also publishes the parameters it can import. These parameters, such as deadlines, numerical tolerances, language, etc, can then be set external to the resource either within the map that imports the resources, or within the context of the course.
PMM/LiLi: Certain parameters like major subject or language are stored within "Campus Virtuell". Exercise parameters, such as deadlines, numerical tolerances, etc., can be set within the context of the course.

3.6 Content Granularity and Bundling

LON-CAPA: Within LON-CAPA, resources can be assembled by reference into higher granularity units (Fig. 3.6). The basic data format for these units are so-called maps, which are XML documents that describe the links and conditional relationships between resources, which in turn can be maps themselves.
PMM/LiLi: Currently a tool to bundle granularity units is developed. Three

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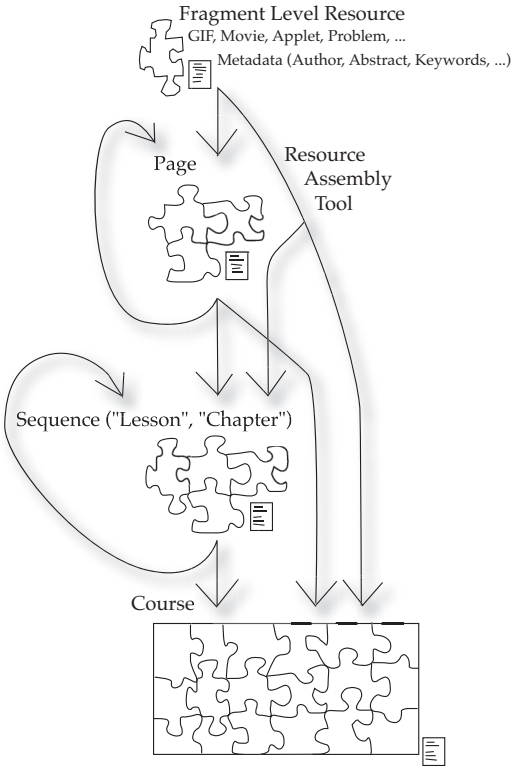

Figure 1: *Resource Assembly in LON-CAPA. With the built-in Resource Assembly Tool, users can sequence resources at different levels of granularity. Each generated sequence in itself becomes a new resource in the system, and can be incorporated into other sequences.*

levels of granularity for exercise tasks are currently handled: tasks, weekly home work collections, and courses. Course assignment is defined according to the log-in information given by the students themselves. Besides sequential bundling of resources, PMM aims to establish additional relationships between content elements. The database has to have a virtual algebra of relations between the building blocks ("atoms"):

– 'atom A has been read earlier than atom B'
– 'atom A is related to the content of atom B'
– 'atom A is more sophisticated than atom B'
– 'atom A is an application of atom B'
– 'atom A belongs to thread C, as presented by lecturer D'

and the respective inverses. In addition, relations between atoms should be given statistical weights. Aggregated search mechanisms have to take into account these relationships to propose appropriate content elements.

3.7 Metadata Format Translation, Federated Search

LON-CAPA: LON-CAPA has an internal metadata format, for which through the NSDL gateway project crosswalks have been implemented to unqualified Dublin Core [17] and IEEE LOM [15]. Open Archive Initiative [18] interfaces are currently being tested.

In addition, LON-CAPA collects dynamic metadata and stores them associated with each resource:

- resource access incidents ("hits") are counted network-wide,
- resource usage — both by bundling (Fig. 3.6) and by hyperlinking ("`<a href='...'>, <img src='...'>`") — are stored with the referenced resource,

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- course usage — LON-CAPA counts the number of unique courses that use a resource,
- user evaluation — users (student and instructors) can both rate and comment on a resource,
- statistical homework date (cummulative degree of difficulty, degree of discrimination, average number of tries, etc) are stored.

While this data is already collected system-wide, it has not yet been utilized for search purposes.
PMM/LiLi: The project's metadata are currently being tested in LiLi. They are based on IEEE LOM and Dublin Core complemented with some proprietary metadata to gain a set of metadata that serve the needs of the project.

3.8 Resource Replication

LON-CAPA: As a distributed network (Fig. 3.8) with a shared digital library layer, it was found mandatory to implement resource replication between the nodes. Particularly since multimedia content can be large in size, replication is needed to be implemented both for the sake of the author and that of the user: for the author, workload on their server is minimized since the actual serving of the resource is accomplished by a server local to the user, and for the user, since content will be closer to them, particularly if their institution does not have high bandwidth or reliable outside connectivity. LON-CAPA uses a subscription-based mechanism to keep distributed copies of a resource up-to-date.
PMM/LiLi: Up to now it is not clear how replication is going to take place. But as soon as several courses make use of the exercise module replication is essential for load balancing.

4 Technical Interoperability Implementation

A server system will be installed as a LON-CAPA library server either at Michigan State University or the University of Oldenburg. We will implement additional software handlers on that server, such that this machine can act as a bidirectional gateway server. These handlers will interface with PMM to implement the mutual mapping and exchange of metadata, bidirectional federated search, the exchange of login information and user profiles, as well as the establishment of a context for the PMM-side standalone rendering of dynamic LON-CAPA resources (such as individualizing homework problems and adaptive content maps).

4.1 Metadata

One goal of the technical interoperability implementation is to research how best to achieve interoperability using a common set of metadata. The effort involved in this research should have wider use by other projects wanting to share their resources, and will build on metadata sharing efforts underway as part of the NSDL.

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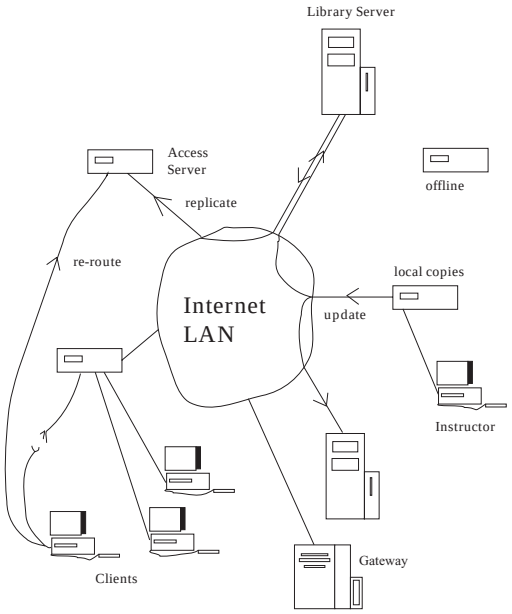

Figure 2: *Distributed LON-CAPA network architecture. The LearningOnline Network physically consists of a cluster of server machines, which are linked through persistent TCP/IP connections using the commodity internet.*
Every participating institution has to contribute at least one library server which holds the authoritative copies of their users' records and resources, and can install any number of access servers which can host sessions for any user of the system.
The network implements resource replication and load balancing between the nodes. It is designed around the principle of having no single point of failure.

LON-CAPA and PMM both use international standards: Dublin Core (DC) [17] and IEEE LOM (Learning Object Metadata [15]). However LON-CAPA uses unqualified DC 1.0 while qualified DC 1.1 is used by PMM. Since incongruent subsets of LOM Metadata are used, a pure dump-down of QDC will not work.

Currently, UOl is developing a metamaker for DC and LOM Metadata to code metadata in html. Ref. [19] is a first version of this - only for "Ariadne metadata" yet. MyMetaMaker [20] is another example of such a metamaker, creating DC metadata coded in html.

Also, UOl is planning to use a HARVEST search engine combined with LiLi to find international physics elearning content. A HARVEST-based gatherer could be installed for LON-CAPA.

Since MSU is working on the task to implement LON-CAPA into NSDL by using OAI metadata, defined by NSDL, this standard should be implemented to PMM as well. We will develop an OAI gateway for the joint metadata.

4.2 Testing and Evaluation

Starting toward the end of the coding effort, users and team members of both systems will be asked to test and evaluate the usability and transparency of

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the gateway. An external evaluator will be asked to gather and compile this feedback, and with the team members, formulate recommendations for future directions.

5 Social Differences in the US and in Germany in Physics Teaching at Universities ("Social Interoperability")

Besides the above listed technical interoperability challenges, there are what might be called "social interoperability challenges."

Physics has the advantage that while there might be "cultural differences" in the approach to its teaching, the content and scope of expected learning outcomes is universal. Physics is an exact science which requires quantitative laboratory experiments and a mathematical formulation of the results, which are then universally valid as Laws of Nature unrelated either to language, or to human social and cultural differences.

However: since teaching physics is a human undertaking, different strategies and habits have developed between the US, West and East German systems.

It is important to understand these social and cultural differences, as well as the differing prerequisites and requirements, in order to merge elearning services coherently.

5.1 Lectures

US: Lectures in university physics classes usually closely follow a chosen textbook in presenting material, and these textbooks tend to be the same at all US-Universities. Lecturers tend to say: 'I read Jackson' (referring to the most common US textbook), rather than 'I teach Electrodynamics'. All students must buy the chosen text, which gives the publisher a strong presence in the teaching process.

Germany: In German universities each lecturer is expected to present a composite that includes all known textbooks, results of recent scholarship, and his own scientific research. Thus lectures often vary widely in the choice of material, including the textbooks used, the chronological order of the topics, and even the ways of writing formulas. Individual textbooks and textbook publishers play a minor role at German universities. The real commercial competition between publishers lies in selling to the library. While individual lecturers may get a free copy, the students are given only a general list of textbooks related to the field. Instructors thus have no opportunity to hone their presentations, because the contents of each lecture can differ substantially from semester to semester.

5.2 Exercises

US: Exercises are mandatory. Their intention is to train students to do calculations and to give them knowledge and experience. They often rely on the one textbook with practical calculus problems (which would be called 'Physics Engineering' in Germany). They are results-oriented: correct numerical results define success. Multiple choice questionnaires are quite common, and passing is

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measured by the number of correctly solved problems.
Germany: Exercises are mandatory in the main courses only. The intention is to train students to be able to understand physics in a broad sense. Ansätze, proofs or derivations are expected more often than correct numerical answers. Students are expected to sketch calculation strategies at the blackboard, to be able to explain the underlying physics, and to be able to answer questions from tutors. Tests are given as homework, and students are strongly encouraged to solve them in groups of 2-5 at home in the course of a week. Homework should have detailed explanations, and each student is expected to be able to present them in class. Grades are given by the tutor at the end of the class based on his impression of students understanding of physics.

5.3 Exams

US: The emphasis is on written exams by each individual student. The grades are thus 'quantitatively objective'. Mathematical skills in particular are tested. In the US this might lead students with specific test-taking skills to feel better supported during their studies, even though they have not learned as much individual responsibility.
Germany: Grades are determined by extended oral exams, by presenting exercises that emphasize physics concepts, and by being able to analyze a topic using physics methods and strategies. In Germany, students are expected to learn to take responsibility for working and learning on their own.

5.4 Social Interoperability Research

An important test of the success of this project is how the social and language differences between US and German students affect the sharing of resources, and whether such sharing is effective. Two research methods will be used: one statistical, the other anthropological.

For the statistical analysis, LON-CAPA, LiLi, and PMM will all keep records on the use of materials. These will provide measures of how often materials are used that came originally from partner collections. Standard statistical tests will be used to determine whether there is any significant ($p \prec .05$) difference in the use of internal and external materials within each learning interface. For more publicly accessible materials, country-level data from the IP connection will be recorded to measure cross-cultural use.

For the anthropological analysis, standard on-site observation and interview methods must be modified to accommodate Internet use [21,22]. The project will use techniques that have been accepted in other US Federally-funded research, such as the Institute of Museum and Library Services supported Feeding America project.

Participating students in both Germany and the US will be invited to complete a Web questionnaire that contains some standard factual questions about age, sex, background, and language skills, and some open-ended questions about their perceptions of the value of the internal and external resources. The verbal responses will be analyzed for social and cultural differences in usage preferences and perceptions. Some of those who fill out the survey will be invited to participate in focus group discussions.

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A similar methodology will be used to evaluate how participating faculty perceive the value of the resource sharing. They will also be asked to fill out an online questionnaire that focuses on their choice of materials for teaching, and will be invited to participate in focus group discussion. Some one-on-one interviews with select faculty may be possible too.

The research will not begin until the second year of the project, and will be done annually to assess progress and provide feedback. All questionnaires will be bilingual, and focus groups and interviews will be conducted in the language of the country where they take place. If all participants consent, the focus groups and interviews will be taped. The MSU University Committee on Research Involving Human Subjects (UCRIHS) will approve all questionnaires and interview or focus group questions prior to use.

Seadle will take responsibility for organizing the anthropological research. He has used anthropological and oral history techniques in Germany and the US since his doctoral work in the 1970s, and has published regularly on anthropological issues relating to digital library work.

6 Copyright Issues and Legal Differences

Copyright issues affect this project in three ways [23]. The first occurs when faculty submit materials to the databases, and when the databases automatically share resources that were submitted to them. Under both US and German law, rights owners who submit their own intellectual property give an implicit permission to publish their materials in that particular venue, without any transfer of copyright. This does not mean that materials sent to, for example, LiLi necessarily include an implicit permission to publish them also in LON-CAPA, but the expectation is that most if not all contributors will give a permission, and this should be easy to obtain [24]. Because of work-for-hire rules in the US, it is also possible that universities could claim ownership in the copyright for teaching materials and restrict their use. The project will contact appropriate university officials to obtain appropriate permissions, when necessary.

The second copyright issue occurs when students submit materials to any of the systems. Under US and German law, the students own the rights to their own materials, even when submitted as part of their course work. The structure of LON-CAPA, LiLi, and PMM respects the privacy of these materials and will keep them from public use. If course developments make open publication desirable, permission will be sought.

The third copyright issue occurs when use is made of already published materials where no participant owns the copyright (or economic exploitation rights). In this case, the project will use the resources of the permissions unit in Michigan State University Libraries' Digital and Multimedia Center (DMC), which handles permission requests for all MSU Virtual University distance education courses. The DMC will serve as the repository for all copyright permissions for this project, and will make them available on request.

The legal differences between US and German copyright law are significant, but not prohibitive. The key areas of difference include: moral rights (Persönlichkeitsrechte), "fair use" (17 USC 107, which has no German direct equivalent), work-for-hire (which has no direct German equivalent), court precedents (important particularly for internet linking legalities), and database pro-

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tection (e.g. the US Feist ruling versus the European Union Database Directive). Seadle does research and training on these and related areas [25,26], and will advise the project about them. He is not a lawyer, however. Should formal legal advice be necessary, it must come through standard university channels.

7 Aggregative work

7.1 Introduction

For collections such as LON-CAPA and LiLi/PMM there is a question of long-run sustainability. In the long-run, these collections can only be sustained if they aggregate enough content. In our case that means that we need to receive enough contributions of elearning objects.

To address this issue, we must start with an analysis of contributors. All our contributors are academics. Academic writers—both as producers of elearning objects and authors of research documents—are both highly individual and highly social. They are individual in the sense that their reputation as an individual determines most of their professional value. They are highly social in the sense that their position is only observable through acts of their discipline peers. Therefore, to impact on academics, services must be created that exploit the urge to define the position of an individual academic within a competitive environment of other academics. The conceptualization of such service will be called "aggregative evaluation". The presence of aggregative data is necessary for the construction of evaluative data. But the opposite is true, too. Evaluative data provides crucial incentives for academics to supply labor to the aggregation process. Authors will have good incentive to maintain an organized collection of their elearning objects, as long as the collection is publicly seen as an official evaluative record of their activities.

LIU will work in parallel on aggregation and evaluation (Sects. 7.2, 7.3).

7.2 Aggregated Collection Work

To impact on academic learning cultures, discipline-specific data aggregation have to be built. Institution-wide approaches are not sufficient, because they do not lead to an aggregation that is sufficiently comprehensive. Thus the gathering of the core descriptive metadata (Sect. 4.1) is essential for the long-term success of the project.

In addition, LIU will be working on services where contributors can register their own elearning projects with the aggregate collections, as well as contribute secondary data—such as classification data—to the collection. LIU will be working on general models and protocols to make this happen, before implementing them in the elearning objects collection.

On a general level, the collection of a collective database poses problems of assigning responsibilities to each contributor. Each contributor who has the power to change the content of an element in the metadata set is an authority for that element. The contributor confers identity to the described item by associating a handle with the descriptive record. A document will be called an "identification strategy" that sets out rules on which descriptor has authority over what subsets of the describables.

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The identification strategy sets out a-many-to-one correspondence from the set of contributors to the set of i.e. all elearning objects and all possible collections of elearning objects. The division of labor will imply a hierarchy of contributors with respect to the describable—we refer to this as the authority hierarchy. Note that the authority hierarchy, just as the identification strategy, is a social convention that has to be set out by the community of contributors. Different communities may arrange for this in different ways. The research will identify ways to describe and implement identification strategies and authority hierarchies in general. This general protocol should be encoded in a descriptive language, such that it can be reused within software written to support collections that have different identifier strategies and authority hierarchies. The encoding will consist of a specific vocabulary that specifies entities and another vocabulary for the relationship between these entities. The model will be encoded in the Resource Description Framework (RDF, [27]) proposed by the World Wide Web consortium (W3C).

The theoretical framework will be independent of object collections that are being described. The implementation software will be limited in this project to Physics elearning objects. As far as the implementation is concerned, there will be web interfaces that will allow professors to add elearning objects, and there will be a different set of interfaces that will interact with secondary contributors, who can add metadata.

7.3 Evaluation research

Quality control through refereeing is the most important aspect of academic writing, but for elearning objects, there are only a few established instances of rigorous peer-reviewed quality control, for example Merlot [28]. The LON-CAPA project is working on peer-review mechanisms for subsets of content, e.g., test banks, but for mere scalability reasons, to cover the whole gamut of its content, research on other evaluation methods is required.

To make elearning objects more attractive, quality control is essential, though:

- For the user—any educator who will be interested in adopting an elearning module for a class will be keen to get some quality signal about it before investing a lot of time adopting it.
- For the author/producer—if no academic value appears to be connected to elearning objects, supply will remain low, for there is no incentive to provide good ones.

Within the elearning dataset that the applicants have assembled, the core descriptive set (consisting of elearning objects, collections thereof, and contributors) will have to be enlarged by vocabularies of service descriptions, and of service usage incidences. For example, the download of a module may be qualified as an incidence. If the module can be operated as a part of the elearning object database, then the usage of the module is a measurable service incident. LON-CAPA already gathers such data (Sect. 3.7), but this data is currently not utilized for either aggregative search or evaluation for lack of an appropriate model.

The project will work on a descriptive model of services and service incidents. The evaluative model describes which basic evaluative methods are

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usable. Within an evaluative method, data from system-wide incidents is translated by a function into a number, which is basically an expression of how well the contributor does with respect to the chosen criterion. The function is parameterized by the evaluative data. Primary evaluative data concern usage evaluation of objects. Secondary evaluative data can be gathered from membership of elearning objects in collections.

There is no hope to find a descriptive syntax that encodes all evaluative methods that one may potentially be interested in. The project will aim to identify the best evaluative methods, and find ways to encode them. A good evaluative method

- can actually be meaningfully explained to users;
- can be calculated from the data that is generated by the elearning object services;
- can be displayed in a visually attractive way;
- is not subject to moral hazard or adverse selection.

The proposal will deliver a general theory of evaluative methods that is applicable to both research and teaching focused collection. A subset of methods will be tested and implemented in the elearning object collections.

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Five relevant publications

- Lecture*Online* software system, since 1997
- "The Real Challenge" software system, Council for Competitiveness, 1999
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- G. Kortemeyer (script and video material compilation), "*Energy Innovation", "Nuclear Stockpile Reliability*", "*Nuclear Stockpile Security*"; (background research and video material compilation), "*Feynman lives!*", **CNN** (Cable News Network) Atlanta, Fall 1996

Synergistic Activities

1. The Lecture*Online* software system has since 1997 been used by over 5000 students at four institutions (MSU, University of Washington, University of Minnesota and Westshore Community College), and has become a centrally supported computing service at MSU. A paper given about Lecture*Online* received the 1998 IEEE Frontiers in Education Conference Best Paper Award.

2. A derivative of Lecture*Online* is now used by the Council for Competiveness to drive the online version of the TIMSS study.
3. NSF Information Technology Grant (NSF-ITR 0085921), http://www.lon-capa.org/

Collaborators and Affiliations

Collaborators

Guy Albertelli (MSU), Ray Batchelor (Simon Fraser University), Wolfgang Bauer (National Superconducting Cyclotron Laboratory, MSU), Cornelius Benhold (George Washington University), Walter Benenson (National Superconducting Cyclotron Laboratory, MSU), Lawrence Brown (Texas A&M), Gerard Crawley (University of South Carolina), Elaine Collins (Westshore Community College), Victor Cook (University of Washington), Frank Daffin (Florida State University), Steve Detweiler (University of Florida), Chaden Djalali (University of South Carolina), Gerard Feldman (George Washington University), Joan Ferrini-Mundy (MSU), Rick Field (University of Florida), Kevin Haglin (Grinnell College), Dennis Houk (Westshore Community College), Lars Jensen (Truckee Meadows Community College), Joseph Kapusta (University of Minnesota), Deborah Kashy (MSU), Edwin Kashy (National Superconducting Cyclotron Laboratory, MSU), Kirby Kemper (Florida State University), Gerd Kunde (Yale University), Roy Lacey (SUNY Stony Brook), James Linnemann (Physics and Astronomy, MSU), Mark Lucas (Ohio University), C. Fred Moore (University of Texas), Catherine Marder (Hope College), Joelle Murray (Linfield College), Hon-Kie Ng (Florida State University), Abby Parrill (University of Memphis), Graham Peaslee (Hop College), Scott Pratt (National Superconducting Cyclotron Laboratory, MSU), William Punch (MSU), Paul Rubin (MSU), Peter Signell (Physics and Astronomy, MSU), Gerhard Stroink (Dalhousie University), Cherryl Speier (MSU), Michael Thoennessen (MSU), Gary Westfall (MSU), Sherry Yenello (Texas A&M).

Graduate and Postdoctoral Advisors

1. Peter Sauer, University of Hannover, Germany
2. Wolfgang Bauer, National Superconducting Cyclotron Laboratory, MSU

Thesis Advisor and Postgraduate-Scholar Sponsor

Thesis advisor for one student; advisor for one postdoctoral fellow and five graduate students

John Brecht (Stanford Research Institute), John Dixon (MSU), Scott Harrison (MSU), Harsha Jagasiah, (MSU), Benjamin Tyszka (Lockhead Martin), Alexander Sakharuk (MSU), Jeremy Wells (MSU)

Edwin Kashy

National Superconducting Cyclotron Laboratory
Michigan State University
East Lansing, MI 48824-1321
Tel. (517) 333-6318, E-mail: Kashy@nscl.msu.edu

Date of Birth: July 8, 1934

Rice University	Physics	B.A., 1956
Rice University	Physics	Ph.D., 1959

Appointments:

NSF Postdoctoral Fellow
Massachusetts Institute of Technology 1959-1960

Instructor
Massachusetts Institute of Technology 1960-1962

Assistant Professor
Princeton University 1962-1964

Associate Professor
Michigan State University 1964-1967

Professor
Michigan State University 1967-1998

University Distinguished Professor,
Michigan State University, 1998- present

Visitor
Niels Bohr Institute Copenhagen 1970-1971

Acting Director
Cyclotron Lab. 1972-1973

Visiting Scientist
University of Paris, Orsay Dec. 1976 - Feb. 1977

Visiting Professor
University of Paris, Orsay Jan.-June 1979

Visiting Professor
University of Paris, Orsay Sept 1990 - Jan 1991

Publications relevant to Project

- *Melding Network Technology with Traditional Teaching*, E. Kashy, M. Thoennessen, Y. Tsai, N.E. Davis, and Guy Albertelli II, Interactive Learning, Anker Publishing Co, D. G. Brown Editor, pp 51-55 (2000)

- *Impact of Asynchronous Learning Networks in Large Lecture Classes*, M. Thoennessen, E. Kashy, Y. Tsai, and N.E. Davis, Group Decisions and Negotiation, Vol. **8**. 371-384, (1999)

- *Using Networked Tools to Promote Student Success in Large Classes*, E. Kashy, M Thoennessen, Y. Tsai, N.E. Davis, and S.L. Wolfe, Journal of Engineering Education, Vol **87**, 385, (1998)

- *Conceptual Questions in Computer-Assisted Assignments*, E. Kashy, S.J. Gaff, N.H. Pawley, W.L.Stretch, S.L. Wolfe, D.J. Morrissey, Y. Tsai, Am. J. of Phys. **63** (11) 1995, 1000-1005.

- *Using Computer-Assisted Personalized Assignments in Freshman Chemistry*, D.J. Morrissey, E. Kashy, and Y. Tsai, J. of Chem. Edu. **72**, (2)1995, 141-146.

- *CAPA - An Integrated Computer-Assisted Personal Assignment System*; E. Kashy, B.M. Sherrill, Y. Tsai, D. Thaler, D. Weinshank, M. Engelmann, and D.J. Morrissey, Am. J. of Phys. 61(1993) 1124

Synergistic Activities:

1) Originated and Led the Development of *CAPA*
2) Project with Sloan Foundation Support: Expanding the impact of ALN's
3) Project with Mellon Foundation Support: Network Technology in Teaching, Assessing Costs and Educational Effectiveness

Collaborators

I. Ahmad, G. Albertelli, S. M. Austin, B. Back, W. Bauer, D. Bazin, R. R. Betts, R. A. Blue, B. A. Brown, F. P. Calaprice, N. E. Davis, P. W. Dickson, J. Duffy, R. Dunford, M. Engelmann, S. J. Freedman, S. Gaff, A. L. Hallin, D. J. Henderson, D. A. Kashy, W. Kutshera, J. Krishnamoorthy, D. Kataria, M. Maier, G. Kortemeyer, C. J. Lister, M. Liu, D. J. Mercer, D. Mikolas, D. J. Morrisey, A. C. Muller, D. Guillemaud-Mueller, N. H. Pawley, R. M. Ronningen, P. Roussel, M. Roy-Stephan, J. P. Schiffer, B. M. Sherrill, W. I. Stretch, D. Thaler, M. Thoennessen, T. Trainer, Y. Tsai, D. Weinshank, J. S. Winfield, S. L. Wolfe, F. L. S. Wolfs, A. H. Wuosmaa, J. Yurkon

Advisors

J. R. Risser

Advisees

K. B. Beard, R. L. Kozub, L. A. Kull, D. Mueller, W. L. Pickles, P. J. Plauger, G. F. Trentelman

Bibliographical section

Thomas Krichel

July 29, 2002

Professional Preparation

1998–12	PhD in Economics from the University of Surrey. Dissertation on "Growth and Fiscal Policy in Dynamic Optimising Models", advisor Paul L. Levine
1990–10	MA in Western European Studies from the University of Exeter
1989–09	Maitrise d'Economie from the Université de Paris I Panthéon-Sorbonne, the Ecole Normale Supérieure and the Ecole des Hautes Etudes en Sciences Sociales
1986–09	Diplôme d'Etudes Universitaires Générales in sciences économiques from the Université des Sciences Sociales de Toulouse
1984–07	Abitur from Realgymnasium Völklingen

Appointments

form 2001–01	Assistant professor at the Palmer School of Library and Information Science, Long Island University
2000–10 to 2000–12	Visiting professor in the Institute for Economic Research at Hitotsubashi University
1993–02 to 2001–04	Lecturer in Economics in the Department of Economics at the University of Surrey
1992–10 to 1993–02	Houblon-Norman research assistant to Michael P. Devereux in the Department of Economics at Keele University
1990–07 to 1992–09	Building Societies Trust Research Assistant in the Department of Economics at Loughborough University of Technology

Publications

(i) Publications closely related to the topic of the proposal

Thomas Krichel and Simeon M. Warner (2001), "Design of a metadata framework to support scholarly communication", , presented at the International Conference on Dublin Core and Metadata Applications in Tokyo, Japan, October 24 to 26, print version available at http://openlib.org/home/krichel/papers/kanda.a4.pdf

José Manuel Barrueco Cruz, Markus J.R. Klink and Thomas Krichel (2000) "Personal data in a large digital library", presented at the Fourth European Conference on Research and Advanced Technology for Digital Libraries in Lisbon, September 18 to 21, print version available at http://openlib.org/home/krichel/papers/phoenix.a4.pdf

Thomas Krichel and Sergei I. Parinov (2002) "The RePEc database and its Russian partner Socionet", Russian Digital Libraries Journal, vol. 5, no. 2, available at http://www.elbib.ru/journal/2002/200202/KP/KP.en.htm

José Manuel Barrueco Cruz and Thomas Krichel (2000) "Prepublications: Centralized vs Decentralized Distribution", Revista Española de Documentación Científica, 2000, vol. 23, no. 2, pp. 9 to 19, preprint available at http://openlib.org/home/krichel/http://www.uv.es/~barrueco/reig.pdf

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Herbert Van de Sompel, Thomas Krichel, Michael L. Nelson, Patrick Hochstenbach, Victor M. Lyapunov, Kurt Maly, Mohammad Zubair, Mohamed Kholief, Xiaoming Liu and Heath O'Connell (2000),"The UPS Prototype: An Experimental End-User Service across E-Print Archives", Dlib Magazine, vol. 6, no. 2, February http://www.dlib.org/dlib/february00/vandesompel-ups/02vandesompel-ups.html

(ii) Other Publications

Thomas Krichel and Paul L. Levine (2001) "Does Precommitment raise Growth? The Dynamics of Growth and Fiscal Policy", Scandinavian Journal of Economics, vol. 103, no. 2, pp. 295 to 317, preprint available at http://openlib.org/home/krichel/papers/grusas.pdf

Thomas Krichel and Paul L. Levine (1999) "The Welfare Economics of Rural to Urban Migration: The Harris-Todaro Model Revisited", Journal of Regional Science 1999, vol. 39, no. 3, pp. 429 to 447.

Thomas Krichel, Paul L. Levine and Joseph Pearlman (1996) "Fiscal and Monetary Policy in a Monetary Union: Credible In¤ation Targets or Monetised Debt?", (, Weltwirtschaftliches Archiv—Review of World Economics, vol. 132, no. 1, pp. 28–54

Apostolos Serletis and Thomas Krichel (1994) "International Evidence on the long-run Implications of the Neoclassical Growth-Model" , Applied Economics 1994, vol. 27, no. 2, pp. 205–210

Apostolos Serletis and Thomas Krichel (1992) "Output Trends in EC Countries and the Implications for Transition to Monetary Union" (with Apostolos Serletis), Economics Letters, vol. 40, no. 2, pp. 211–216

Synergetic activities

Founder and principal coordinator of RePEc, the largest decentralized academic digital library in the world,

Co-founder of the Open Archives Initiative, which implements the principals behind RePEc on a more general level,

Founder and director of the NetEc cooperative of academic libraries,

Principal architect of the Academic Metadata Format, which will be implemented as the default metadata for the Eprints System produced at Southampton University,

Member of the Steering committee of the JISC-NSF funded "Integrating and Navigating Eprint Archives through Citation-Linking" project, a partnership of Cornell University, Southampton University and Los Alamos National Laboratory.

Collaborators & Other Af£liations

(i) Collaborators

José Manuel Barrueco Cruz (University of ValenciÁ), Bernado Batiz-Lazo (Open University Business School), Christopher F. Baum (Boston College), Tim Brody (University of Southampton), Eberhard R. Hilf (University of Oldenburg), Sune Karlsson (Stockholm School of Economics), Gerd Kortemeyer (Michigan State University), Elizabeth Gadd (Loughborough University), Michael L. Nelson (NASA), Sergey I. Parinov (Siberian Branch of the Russian Academy of Sciences), Robert P. Parks (Washington University at St. Louis), Antonella De Robbio (Padova University), Christoph Schick (University of Rostock), Herbert Van de Sompel (Los Alamos National Laboratory), Simeon M. Warner (Cornell University), Satoshi Yasuda (Hitotsubashi University), Christian Zimmermann (Université du Québec aÁMontréal)

(ii) PhD advisor

Paul L. Levine (University of Surrey)

(iii) PhD advisees

Marco Catenaro (European Central Bank)

Full CV at http://openlib.org/home/krichel/cv.html

0240171

Michael Steven Seadle
Curriculum Vitae

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EDUCATION:

- University of Chicago: PhD in History, 1977; MA 1973.
- University of Michigan: MS. in Information (Information and Library Service) 1997. (ALA accredited degree.) Winner of the Margaret Mann Award. Beta Phi Mu (honorary society).
- Earlham College: BA (honors) in history, 1972. Phi Beta Kappa.
- Cranbrook School: Diploma Cum Laude, 1968.

PROFESSIONAL EMPLOYMENT:

- Digital Services Librarian and Copyright Librarian / Head, Digital and Multimedia Center (including the Vincent Voice Library), Michigan State University, East Lansing, MI, 1998-
- Digital Information Associate. University of Michigan, Ann Arbor, MI, 1996-97
- President, Seadle Consulting, East Lansing, MI., 1992-1996.
- Online Operations Manager and Assistant Director, Library Technology Department, Cornell University, Ithaca, NY, 1989-1992
- Assistant Director for Academic Computing and User Support Services, Eastern Michigan University, Ypsilanti, MI, 1987-1989
- VM Systems Programmer and Database Manager, American Dental Association, Chicago, IL, 1984-1987.
- Lead Analyst, Bankers Life and Casualty, Chicago, IL, 1983-1984.
- Programmer, Washington National Insurance, Evanston, IL, 1981-1983.
- Supervisor, South Asia Collection, University of Chicago Library, Chicago, IL, 1976-81.

GRANTS:

- Principal Investigator with Peter Berg, "Feeding America: The Historic American Cookbook Project," Institute of Museum and Library Services award, 2001 - 2003.
- Principal Investigator with Peter Berg, "Shaping the Values of Youth: A Nineteenth Century American Sunday School Book Collection," Library of Congress/Ameritech National Digital Library award, 1999-2001.
- Co-Principal Investigator with Mark Kornbluh, John Deller, and Joyce Grant, "National Gallery of the Spoken Word," Digital Library Initiative (Phase 2) award, 1999-2004.
- Co-Principal Investigator with David Wiley, Fredric Bohm, Mark Kornbluh, Joseph Lauer, "Accessing African Scholarly Journals: Sustainable Electronic Publishing and Indexing of African Journals through International Cooperation," Title VI International Education Program award, 1999-2000
- Co-Principal Investigator with Mark Kornbluh, David Robinson, David Wiley, "Building a Multi-Lingual Digital Library for West African Sources," International Digital Library Initiative award, 2000-2003.

EDITORSHIPS, GRANTS, BOARD MEMBERSHIPS, CHAIRMANSHIPS:

- Editor, *Library Hi Tech*, MCB University Press, Bradford, UK, 1997-
- Editorial Board, *Reference Services Review*, 1998-
- Member, Emerald / MCB University Press Research Fund Board, 2001-
- Chair, Digitization Committee, Action Team for Library Advancement Statewide, 2001-
- Chair, Electronic Text Centers Discussion Group, American Library Association, 1998-
- Coordinator, Digital Libraries Working Group, German Resources Project, Association of Research Libraries, 1998-
- Production Editor, *South Asia Libraries Notes and Queries*, 1979-81

SELECTED RECENT TALKS AND PUBLICATIONS:

- "Copyright in the Networked World: New Rules for Images," in *Library Hi Tech*, v. 20, no. 2, 2002.
- Michael Seadle, J. R. Deller, Jr., Aparna Gurijala, "Why Watermark? The Copyright Need for an Engineering Solution," in *Proceedings of the Second ACM/IEEE-CS Joint Conference on Digital Libraries*, Portland, Or., 14-18 July 2002.
- "US Copyright für deutsche Bibliotheken" presented at der 92. Deutsche Bibliothekartag, Augsburg, Germany, 11 April 2002.
- "Whose Rules? Intellectual Property, Culture, and Indigenous Communities," *D-Lib Magazine*, Mar, 2002, Vol. 8, no. 3. Available: http://www.dlib.org/
- "Copyright in the Networked World: Moral Rights," in *Library Hi Tech*, v. 20, no. 1, 2002.
- "Copyright in the Networked World: Multimedia Fair Use," in *Library Hi Tech*, v. 19, no. 4, 2001.
- "Copyright in the Networked World: Sound Publication," in *Library Hi Tech*, v. 19, no. 2, 2001.
- "Spoken Words, Unspoken Meanings: A DLI2 Project Ethnography," D-Lib Magazine, Nov., 2000. Available: http://www.dlib.org/
- "Project Ethnography: An Anthropological Approach to Assessing Digital Library Services," *Library Trends* v. 49, no. 2.
- "Copyright in the Networked World: Linking Legalities" in *Library Hi Tech*, v. 18, no. 4, 2000.

COLLABORATORS:

John Deller (MSU)
Mark Kornbluh (MSU)
Lisa Robinson (MSU)
Peter Berg (MSU)
David Robinson (MSU)
Sandra Clark (Michigan Historical Center)
Maurita Holland (U of Michigan)
Sandra Yee (Wayne)
John Hansen (Colorado – Boulder)
Joyce Grant (MSU)
Ruth Ann Jones (MSU)
David Wiley (MSU)
Jo Budler (Library of Michigan)
Laurie Dickens (Michigan Historical Center)
Aparna Gurijala (MSU Student)

ADVISORS:

PhD Advisor: William H. McNeill (U of Chicago, retired)
MSI Advisor: Karen Drabenstott (U of Michigan)

Eberhard R. Hilf

Universities at Hamburg 1954-1959, Muenchen 1955/56, Berlin 1958/59,Frankfurt 1960-67
University Hamburg: Physics; Vordiplom (sehr gut) 1957
University Frankfurt: Physics; Diplom (sehr gut) 1960
University Frankfurt: Theoretical Physics; Promotion (magna cum laude) 1967

Appointments

- CEO Institute for Science Networking Oldenburg GmbH at the Carl von Ossietzky University 2002
- Full professor for Theoretical Physics as Carl von Ossietzky University Oldenburg 1985-2000
- Tenure Professor for Theoretical Physics at Technische Hochschule Darmstadt 1972-1985
- Tenure Professor for Theoretical Physics at Heinrich Heine University Duesseldorf 1971/72
- Scientific Assistant at Universities of Wuerzburg 1967-1971 and Frankfurt 1966/67

Publications

Severiens, M. Hohlfeld, K. Zimmermann, E. R. Hilf, PhysDoc - A Distributed Network of Physics Institutions Documents - Collecting, Indexing, and Searching High Quality Documents by using Harvest D-Lib Magazin, Vol. 6 No. 12, December 2000
http://www.isn-oldenburg.de/pub/dlib2000.html

E. R. Hilf, M. Hohlfeld, T. Severiens, K. Zimmermann, Distributed Information Services in Physics; High Energy Physics Libraries Webzine [ISSN 1424-2729] Issue 4 / June 2001
http://library.cern.ch/HEPLW/4/papers/2/

E. R. Hilf, Hans-Joachim Watjen, Publishing and Refereeing in a Distributed World - the Views of a Physicist and a Librarian; Presentation given at the workshop {The Open Archives initiative (OAI) and Peer Review journals in Europe, Geneva, 22 - 24 Mar. 2001
http://www.isn-oldenburg.de/talks/cern2001/

E. R. Hilf, Physics Archiving: Requirements, Perspectives, and some Approaches in Germany, Presentation given at the IUPAP Workshop ``Long Term Archiving of Digital Documents in Physics" Centre pour la Communication Scientifique Directe, CNRS, Lyon, France, 5 - 6 Nov. 2001
http://physnet.uni-oldenburg.de/~hilf/vortraege/lyon01/

Other significant publications

K. Zimmermann, T. Severiens, E. R. Hilf, Ihre Homepage als Beitrag zu einem Fach-Informationsnetz Phys. Bl., April 2000, p. 3
http://www.physik.uni-oldenburg.de/documents/UOL-THEO3-2000-1/

E. R. Hilf, J. Mimkes, Learning and Research Success - the role of libraries in the IT age presentation given at the 6th European Bielefeld Colloquium, Bielefeld, 5 - 7 Feb. 2002
http://physnet.uni-oldenburg.de/~hilf/vortraege/bielefeld02/

E. R. Hilf, Elektronische Information f\"ur die Physik; (Grunds\"atze eines Informationsmanagements) Phys. Bl. 53 (1997) Nr. 4, p. 311-315
http://www.physik.unioldenburg.de/Docs/THEO3/information/publications/metafiles/9702.html

E. R. Hilf, L. Weisel, Dringender Diskussionsbedarf - Wie soll die elektronische Information und Kommunikation in der Physik zuk\"unftig aussehen? Phys. Bl. 50 (1994) Nr. 1, p. 65
http://www.physik.uni-oldenburg.de/Docs/THEO3/information/publications/metafiles/physbl.194.html

P. Borrmann, H. Stamerjohanns, E. R. Hilf, D. Tomanek, Paradoxical Magnetic Cooling in a Structural Transition Model European Physical Journal B 19, 117-119 (2001)
http://www.smallsystems.de/publications/metadocs/paradoxical.html

Synergistic Activities

Physnet: the physics departments worldwide and document network
http://www.physics-network.org/PhysNet/

Marenet: the worldwide Network of Marine Research Institutions and Documents
http://marenet.uni-oldenburg.de/MareNet/

Open Archives: Distributed services for physicists and graduate students
http://www.isn-oldenburg.de/projects/OAD/

Hosting the home page and LiLi (Links to educational content in physics) of the project "Physik Multimedial"
http://www.physik-multimedial.de/}, \url{http://www.physik-multimedial.de/lili/golili/lili.php

Physics Editor for {Distributed eLearning in Chemistry in Germany}
http://www.vs-c.de/

Collaborators and Other Affiliations

Collaborators from Oldenburg:

Bernd Diekmann, Peter Borrmann, Michael Hohlfeld, Oliver Mulken, Thomas Severiens, Heinrich Stamerjohanns, Hans-Joachim Watjen, Kerstin Zimmermann

Others:

Fox, E., Virginia Tech;
Kortemeyer, G., MSU East Lansing;
Krichel, T., Long Island University;
Schumacher, D. University of Duesseldorf;
Rackwitz, R., University of Hamburg;
Riedel, H-E., University of Rostock;
Ryder, P., University of Bremen;
Schecker, H., University of Bremen;
Wilke, C., University of Greifswald;
Royce Zia, Virginia Tech

Thesis Advisor and Postgraduate-Scholar Sponsor of the last five years for}

Thomas Severiens, Oliver Mulken, Jens Harting
Jens Hellmers, Kerstin Zimmermann, Gunter Rohen
Heinrich Stamerjohanns

The total number of graduate students advised and postdoctoral scholars sponsored: 23

Julika Mimkes

University Oldenburg 1994-2001
University of California, Santa Cruz 1998
Univ. Oldenburg: Physics; Vordiplom (gut) 1996
Univ. Oldenburg: Physics; Diplom (seht gut) 2001

Appointments

Project Manager at the Institute for Science Networking Oldenburg GmbH at the Carl von Ossietzky University since 2001

Publications

J. Mimkes, Verteilte Archive, Metadaten und Bereitstellung von eLearning - Modulen - Stand der Arbeiten im BMBF Projekt Physik Multimedial, Proceedings des Workshops "Standardisierung im eLearning", Frankfurt, Deutschland, April, 2002, http://www.httc.de/nmb/images/Mimkes-v1.pdf

Other significant publications

E. R. Hilf, J. Mimkes, Learning and Research Success - the role of libraries in the IT age, presentation given at the 6th European Bielefeld Colloquium, Bielefeld, 5 - 7 Feb. 2002, http://physnet.uni-oldenburg.de/~hilf/vortraege/bielefeld02/

Synergistic Activities

Physnet: the physics departments worldwide and document network
http://www.physics-network.org/PhysNet/

Marenet: the worldwide Network of Marine Research Institutions and Documents
http://marenet.uni-oldenburg.de/MareNet/

Open Archives: Distributed services for physicists and graduate students
http://www.isn-oldenburg.de/projects/OAD/

Hosting the home page and LiLi (Links to educational content in physics) of the project "Physik Multimedial" http://www.physik-multimedial.de/
http://www.physik-multimedial.de/lili/golili/lili.php

Physics Editor for Distributed eLearning in Chemistry in Germany
http://www.vs-c.de/

Collaborators and Other Affiliations

Collaborators from Oldenburg:

Bernd Diekmann, Peter Borrmann, Michael Hohlfeld, Oliver Mulken,Thomas Severiens, Heinrich Stamerjohanns, Hans-Joachim Watjen,
Kerstin Zimmermann

Others:

Fox, E., Virginia Tech;
Kortemeyer, G., MSU East Lansing;
Krichel, T., Long Island University;
Schumacher, D. University of Duesseldorf;
Rackwitz, R., University of Hamburg;
Riedel, H-E., University of Rostock;
Ryder, P., University of Bremen;
Schecker, H., University of Bremen;
Wilke, C., University of Greifswald;
Royce Zia Virginia Tech

Graduate Advisor:
Dr. Rainer Reuter, Department of Physics, University Oldenburg

Christoph Schick

Date of birth: March 16th, 1953
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Professional Preparation

Undergraduate Institution(s) Major Degree & Year
Technical University of Leuna-Merseburg, Diploma in Physics, 1976
Graduate Institution(s) Major Degree & Year
Technical University of Leuna-Merseburg, Ph.D. in Experimental Physics, 1980
Thesis: Time dependence of the enthalpy in the glass transition region of poly(vinyl chloride) (PVC)
Postdoctoral Institution(s) Area Inclusive Dates (years)
Pedagogical University Guestrow, Polymer physics, 1980-1986
Charles University Praha, CZ, Polymer physics, 1987
Pedagogical University Guestrow, Polymer physics, 1987-1988
1988 Habilitation in Experimental Physics,
Title: Influence of the morphology on the molecular mobility in the amorphous regions of semicrystalline Polymers

Appointments

1992 Physics Department, University of Rostock, professor
1979 Physics Department, Pedagogical University Gstrow, senior research fellow, first assistant to professor
1976 Physics Department, Technical University of Leuna-Merseburg, research fellow

Publications

closely related to the proposed project

A. Wurm, D. Schick, C. Schick, Erste Erfahrungen mit webbasierten Übungsaufgaben in der Nebenfachausbildung Physik (Web based home work tasks for physics education for non-physicists - first results), DPG Spring meeting, Leipzig, DD 19.1, 2002

other significant publications

Wurm, A.; Schick , C., Development of thermal stability of polymer crystals during isothermal crystallization, e-Polymers 2002, no. 024

Schick, C.; Wurm, A.; Mohammed, A., Vitrification and Devitrification of the rigid amorphous fraction of semicriystallline polymers revealed
from frequency dependent heat capacity, Coll. Polym. Sci. 279 (2001) 800-806

Donth, E.; Hempel, E.; Schick, C., Does temperature fluctuate? Indirect proof by dynamic glass transition in confined geometries, J. Phys.: Condens. Matter, 12 (2000) 281-286

Schick C.; Merzlyakov M.; Hensel A., Non-linear Thermal Response at the Glass Transition
J. Chem. Phys., 111 (1999) 2695-2700.

Hensel, A.; Schick, C., Relation Between Freezing-In due to Linear Cooling and the Dynamic Glass Transition Temperature by Temperature Modulated DSC, J. Non-Cryst. Solids, 235-237 (1998) 510-516

Synergistic Activities
Development of a web-based exercise module for home work and self-testing (pmm collaboration)
Guest editor for special issues of Thermochimica Acta

Collaborators
Donth, E., University of Halle
Friedrich, J., University of Bremen
Hilf, E., University of Oldenburg
Kortemeyer, G., MSU East Lansing
Krichel, T., Long Island University
Rackwitz, R., University of Hamburg

Riedel, H-E., University of Rostock
Ryder, P., University of Bremen
Schecker, H., University of Bremen
Schonhals, A., BAM Berlin
Wilke, C., University of Greifswald

Graduate and Postdoctoral Advisors
graduate advisor: Donth, E., retired
principal postdoctoral sponsor: Mischok, W.: retired

Thesis Advisor and Postgraduate-Scholar Sponsor
Thesis advisor for:
Weyer, S., Wurm, A.: University of Rostock
Hensel, A.: Deutsche Telekom AG
Koy, U.: Town of Rostock
Merzliakov, M.: Texas Tech, TX
Mohammed, Alaa: University of Mansoura, Egypt
Postgraduate-scholar sponsor for:
Dobbertin, J.: Fachhochschule Wismar
Majumder, T.: University Calcutta, India
Sukhorukov, D., Meissner, D., Bulut, S.: University of Rostock

SUMMARY PROPOSAL BUDGET YEAR 1

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION: **Michigan State University**

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR: **Gerd Kortemeyer**

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-mos. CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Gerd Kortemeyer - PI**	**0.60**	**0.00**	**0.00**	$ **3,413**	$
2. **Edwin Kashy - none**	**0.00**	**0.00**	**0.00**	**0**	
3. **Thomas Krichel - co-PI**	**0.00**	**0.00**	**0.00**	**0**	
4. **Michael S Seadle - co-PI**	**1.20**	**0.00**	**0.00**	**6,405**	
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	**0.00**	**0.00**	**0.00**	**0**	
7. (**4**) TOTAL SENIOR PERSONNEL (1 - 6)	**1.80**	**0.00**	**0.00**	**9,818**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL ASSOCIATES	**0.00**	**0.00**	**0.00**	**0**	
2. (**1**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	**6.00**	**0.00**	**0.00**	**20,000**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**2**) UNDERGRADUATE STUDENTS				**8,000**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**1**) OTHER				**13,500**	
TOTAL SALARIES AND WAGES (A + B)				**51,318**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**15,594**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**66,912**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**2,000**	
2. FOREIGN				**8,000**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**5,000**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**63,698**	
6. OTHER				**0**	
TOTAL OTHER DIRECT COSTS				**68,698**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**145,610**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **MTDC (Rate: 49.0000, Base: 106912)**					
TOTAL INDIRECT COSTS (F&A)				**52,387**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**197,997**	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **197,997**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME: **Gerd Kortemeyer**

ORG. REP. NAME*: **Craig oneill**

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET YEAR 2

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION: **Michigan State University**

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR: **Gerd Kortemeyer**

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-mos. CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Gerd Kortemeyer - PI**	**0.60**	**0.00**	**0.00**	$ **3,583**	$
2. **Edwin Kashy - none**	**0.00**	**0.00**	**0.00**	**0**	
3. **Thomas Krichel - co-PI**	**0.00**	**0.00**	**0.00**	**0**	
4. **Michael S Seadle - co-PI**	**1.20**	**0.00**	**0.00**	**6,725**	
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	**0.00**	**0.00**	**0.00**	**0**	
7. (**4**) TOTAL SENIOR PERSONNEL (1 - 6)	**1.80**	**0.00**	**0.00**	**10,308**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL ASSOCIATES	**0.00**	**0.00**	**0.00**	**0**	
2. (**1**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	**6.00**	**0.00**	**0.00**	**20,800**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**2**) UNDERGRADUATE STUDENTS				**8,000**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**1**) OTHER				**14,040**	
TOTAL SALARIES AND WAGES (A + B)				**53,148**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**16,253**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**69,401**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**2,000**	
2. FOREIGN				**5,000**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**2,000**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**65,982**	
6. OTHER				**0**	
TOTAL OTHER DIRECT COSTS				**67,982**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**144,383**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **MTDC (Rate: 49.5000, Base: 78402)**					
TOTAL INDIRECT COSTS (F&A)				**38,809**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**183,192**	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **183,192**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME: **Gerd Kortemeyer**

ORG. REP. NAME*: **Craig oneill**

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET — YEAR 3

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION: **Michigan State University**

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR: **Gerd Kortemeyer**

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-mos. CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Gerd Kortemeyer - PI**	**0.60**	**0.00**	**0.00**	$ **3,762**	$
2. **Edwin Kashy - none**	**0.00**	**0.00**	**0.00**	**0**	
3. **Thomas Krichel - co-PI**	**0.00**	**0.00**	**0.00**	**0**	
4. **Michael S Seadle - co-PI**	**1.20**	**0.00**	**0.00**	**7,062**	
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	**0.00**	**0.00**	**0.00**	**0**	
7. (**4**) TOTAL SENIOR PERSONNEL (1 - 6)	**1.80**	**0.00**	**0.00**	**10,824**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL ASSOCIATES	**0.00**	**0.00**	**0.00**	**0**	
2. (**1**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	**6.00**	**0.00**	**0.00**	**21,632**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**2**) UNDERGRADUATE STUDENTS				**8,000**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**1**) OTHER				**14,602**	
TOTAL SALARIES AND WAGES (A + B)				**55,058**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**16,941**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**71,999**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**2,500**	
2. FOREIGN				**5,000**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**2,000**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**68,382**	
6. OTHER				**0**	
TOTAL OTHER DIRECT COSTS				**70,382**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**149,881**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **MTDC (Rate: 49.5000, Base: 81498)**					
TOTAL INDIRECT COSTS (F&A)				**40,342**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**190,223**	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **190,223**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME: **Gerd Kortemeyer**

ORG. REP. NAME*: **Craig oneill**

FOR NSF USE ONLY — INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET

Cumulative

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
Michigan State University

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Gerd Kortemeyer

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-mos. CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Gerd Kortemeyer - PI**	**1.80**	**0.00**	**0.00**	$ **10,758**	$
2. **Edwin Kashy - none**	**0.00**	**0.00**	**0.00**	**0**	
3. **Thomas Krichel - co-PI**	**0.00**	**0.00**	**0.00**	**0**	
4. **Michael S Seadle - co-PI**	**3.60**	**0.00**	**0.00**	**20,192**	
5.					
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	**0.00**	**0.00**	**0.00**	**0**	
7. (**4**) TOTAL SENIOR PERSONNEL (1 - 6)	**5.40**	**0.00**	**0.00**	**30,950**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL ASSOCIATES	**0.00**	**0.00**	**0.00**	**0**	
2. (**3**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	**18.00**	**0.00**	**0.00**	**62,432**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**6**) UNDERGRADUATE STUDENTS				**24,000**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**3**) OTHER				**42,142**	
TOTAL SALARIES AND WAGES (A + B)				**159,524**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**48,788**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**208,312**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**6,500**	
2. FOREIGN				**18,000**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**9,000**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**198,062**	
6. OTHER				**0**	
TOTAL OTHER DIRECT COSTS				**207,062**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**439,874**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
TOTAL INDIRECT COSTS (F&A)				**131,538**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**571,412**	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **571,412**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
Gerd Kortemeyer

ORG. REP. NAME*
Craig oneill

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

C ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

Budget Justification Page

International Digital Library Interoperability
for Physics E-learning Objects

Michigan State University
NSF 02-085
Budget Justification

A. Senior Personnel:
Salary and fringes for principal investigator, Gerd Kortemeyer (5% all years) and co-PI, Michael Seadle (10% all years) are requested in this proposal. Drs. Kortemeyer and Seadle will provide oversight and direction to the project. Calculations in years 2 and 3 include a five percent raise (5%) each year.

B. Other Personnel:
B2-Salary and fringes for one half-time programmer who will be responsible for the day-to-day programming operations for the project are requested. Years 2-3 include a four percent base wage increase.

B4-Hourly wages are requested for two undergraduate student employees.

B6-Thirty percent (30%) of salary and fringes are requested for project administration/management. Years 2-3 include a four percent base wage increase.

C. Fringe Benefits:
A fringe benefit rate of 36% for all years was used to estimate fringe benefits for all salaries for the duration of the project.

E. Travel:
Both international and domestic travel is requested. Travel funds will be utilized for continued collaboration with partners in Germany and Long Island University. Attendance to conferences to publicize the collaborative efforts is essential.

G1-Materials and Supplies
Materials and supplies category will cover project computer, materials and specific office expenses related to the project (copy charges, long distance telephone/fax charges, etc.).

G5-Subcontracts
A three year subcontract to Long Island University is included in this budget. Dr. Thomas Krichel will serve as PI on subcontract. A separate subcontract budget justification is provided.

I-Indirect Costs
Rates of 49% for year 1 and 49.5% for year 2 are used to calculate indirect costs on the modified total direct costs. Overhead is charged on the first $25,000 of year one subcontract only.

The Division of Science and Mathematics Education will provide budget management. No cost share is required for this proposal and therefore, none is listed.

SUMMARY PROPOSAL BUDGET

YEAR 1

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
Long Island University C W Post Center

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Thomas Krichel

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-mos. CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Thomas Krichel**	**0.00**	**4.50**	**0.00**	$ **28,500**	$
2. **Gerd Kortemeyer**	**0.00**	**0.00**	**0.00**	**0**	
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	**0.00**	**0.00**	**0.00**	**0**	
7. (**2**) TOTAL SENIOR PERSONNEL (1 - 6)	**0.00**	**4.50**	**0.00**	**28,500**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL ASSOCIATES	**0.00**	**0.00**	**0.00**	**0**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	**0.00**	**0.00**	**0.00**	**0**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**0**) UNDERGRADUATE STUDENTS				**0**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**28,500**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**8,294**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**36,794**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**2,000**	
2. FOREIGN				**3,000**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**0**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**12,000**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**1,000**	
TOTAL OTHER DIRECT COSTS				**13,000**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**54,794**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **wages/fringe (Rate: 24.2000, Base: 36794)**					
TOTAL INDIRECT COSTS (F&A)				**8,904**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**63,698**	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **63,698**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
Thomas Krichel

ORG. REP. NAME*
Craig oneill

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

1 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET YEAR 2

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
Long Island University C W Post Center

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Thomas Krichel

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-mos. CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Thomas Krichel**	**0.00**	**4.50**	**0.00**	$ **29,925**	$
2. **Gerd Kortemeyer**	**0.00**	**0.00**	**0.00**	**0**	
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	**0.00**	**0.00**	**0.00**	**0**	
7. (**2**) TOTAL SENIOR PERSONNEL (1 - 6)	**0.00**	**4.50**	**0.00**	**29,925**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL ASSOCIATES	**0.00**	**0.00**	**0.00**	**0**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	**0.00**	**0.00**	**0.00**	**0**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**0**) UNDERGRADUATE STUDENTS				**0**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**29,925**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**8,708**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**38,633**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**2,000**	
2. FOREIGN				**3,000**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**0**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**12,000**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**1,000**	
TOTAL OTHER DIRECT COSTS				**13,000**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**56,633**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **wages/fringe (Rate: 24.2000, Base: 38633)**					
TOTAL INDIRECT COSTS (F&A)				**9,349**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**65,982**	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **65,982**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
Thomas Krichel

ORG. REP. NAME*
Craig oneill

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INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET YEAR 3

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
Long Island University C W Post Center

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Thomas Krichel

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-mos. CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Thomas Krichel**	**0.00**	**4.50**	**0.00**	$ **31,421**	$
2. **Gerd Kortemeyer**	**0.00**	**0.00**	**0.00**	**0**	
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	**0.00**	**0.00**	**0.00**	**0**	
7. (**2**) TOTAL SENIOR PERSONNEL (1 - 6)	**0.00**	**4.50**	**0.00**	**31,421**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL ASSOCIATES	**0.00**	**0.00**	**0.00**	**0**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	**0.00**	**0.00**	**0.00**	**0**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**0**) UNDERGRADUATE STUDENTS				**0**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**31,421**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**9,143**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**40,564**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**2,000**	
2. FOREIGN				**3,000**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**0**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**12,000**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**1,000**	
TOTAL OTHER DIRECT COSTS				**13,000**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**58,564**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **wages/fringe (Rate: 24.2000, Base: 40564)**					
TOTAL INDIRECT COSTS (F&A)				**9,816**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**68,380**	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **68,380**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
Thomas Krichel

ORG. REP. NAME*
Craig oneill

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INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET

Cumulative

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
Long Island University C W Post Center

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Thomas Krichel

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-mos. CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Thomas Krichel**	**0.00**	**13.50**	**0.00**	$ **89,846**	$
2. **Gerd Kortemeyer**	**0.00**	**0.00**	**0.00**	**0**	
3.					
4.					
5.					
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	**0.00**	**0.00**	**0.00**	**0**	
7. (**2**) TOTAL SENIOR PERSONNEL (1 - 6)	**0.00**	**13.50**	**0.00**	**89,846**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL ASSOCIATES	**0.00**	**0.00**	**0.00**	**0**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	**0.00**	**0.00**	**0.00**	**0**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**0**) UNDERGRADUATE STUDENTS				**0**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**89,846**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**26,145**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**115,991**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**6,000**	
2. FOREIGN				**9,000**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**0**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**36,000**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**3,000**	
TOTAL OTHER DIRECT COSTS				**39,000**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**169,991**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
TOTAL INDIRECT COSTS (F&A)				**28,069**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**198,060**	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **198,060**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
Thomas Krichel

ORG. REP. NAME*
Craig oneill

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Date Checked	Date Of Rate Sheet	Initials - ORG

C ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

Budget Justification Page

Salary and fringes for LIU subcontract principal investigator, Thomas Krichel (4.5 academic months/year)are requested. A fringe benefit rate of 29.1% is utilized.

For the second year, assuming 5% wage inflation, as negociated in the local union contract. For the third year, assuming 5% wage inflation, but that is not negociated at the moment.

Domestic and international travel is requested for continued collaborative efforts and publicizing results.

Other - materials and supplies are requested.

Programming consultants will be utilized in this project

Overhead is calculated using an indirect rate of 24.2% of wages.

SUMMARY PROPOSAL BUDGET YEAR 1

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
Uniersitat Oldenburg

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Eberhard R Hilf

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-mos. CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Eberhard R Hilf - PI**	**0.00**	**0.00**	**0.00**	$ **0**	$
2. **Julika Mimkes - Project Manager**	**0.00**	**0.00**	**0.00**	**56,000**	
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	**0.00**	**0.00**	**0.00**	**0**	
7. (**2**) TOTAL SENIOR PERSONNEL (1 - 6)	**0.00**	**0.00**	**0.00**	**56,000**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL ASSOCIATES	**0.00**	**0.00**	**0.00**	**0**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	**0.00**	**0.00**	**0.00**	**0**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**2**) UNDERGRADUATE STUDENTS				**8,500**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**64,500**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**0**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**64,500**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**0**	
2. FOREIGN				**5,000**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**4,000**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**0**	
TOTAL OTHER DIRECT COSTS				**4,000**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**73,500**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **Total Direct (Rate: 5.0000, Base: 73500)**					
TOTAL INDIRECT COSTS (F&A)				**3,675**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**77,175**	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **77,175**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
Eberhard R Hilf

ORG. REP. NAME*
Julika Mimkes

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INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET YEAR 2

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
Uniersitat Oldenburg

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Eberhard R Hilf

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-mos. CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Eberhard R Hilf - PI**	**0.00**	**0.00**	**0.00**	$ **0**	$
2. **Julika Mimkes - Project Manager**	**0.00**	**0.00**	**0.00**	**56,000**	
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	**0.00**	**0.00**	**0.00**	**0**	
7. (**2**) TOTAL SENIOR PERSONNEL (1 - 6)	**0.00**	**0.00**	**0.00**	**56,000**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL ASSOCIATES	**0.00**	**0.00**	**0.00**	**0**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	**0.00**	**0.00**	**0.00**	**0**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**2**) UNDERGRADUATE STUDENTS				**8,500**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**64,500**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**0**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**64,500**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**0**	
2. FOREIGN				**5,000**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**0**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**0**	
TOTAL OTHER DIRECT COSTS				**0**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**69,500**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **Total Direct (Rate: 5.0000, Base: 69500)**					
TOTAL INDIRECT COSTS (F&A)				**3,475**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**72,975**	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **72,975**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
Eberhard R Hilf

ORG. REP. NAME*
Julika Mimkes

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INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET YEAR 3

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
Uniersitat Oldenburg

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Eberhard R Hilf

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-mos. CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Eberhard R Hilf - PI**	**0.00**	**0.00**	**0.00**	$ **0**	$
2. **Julika Mimkes - Project Manager**	**0.00**	**0.00**	**0.00**	**56,000**	
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	**0.00**	**0.00**	**0.00**	**0**	
7. (**2**) TOTAL SENIOR PERSONNEL (1 - 6)	**0.00**	**0.00**	**0.00**	**56,000**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL ASSOCIATES	**0.00**	**0.00**	**0.00**	**0**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	**0.00**	**0.00**	**0.00**	**0**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**2**) UNDERGRADUATE STUDENTS				**8,500**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**64,500**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**0**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**64,500**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**0**	
2. FOREIGN				**5,000**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**0**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**0**	
TOTAL OTHER DIRECT COSTS				**0**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**69,500**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **Total Direct (Rate: 5.0000, Base: 69500)**					
TOTAL INDIRECT COSTS (F&A)				**3,475**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**72,975**	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **72,975**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
Eberhard R Hilf

ORG. REP. NAME*
Julika Mimkes

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET

Cumulative

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
Uniersitat Oldenburg

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Eberhard R Hilf

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-mos. CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Eberhard R Hilf - PI**	**0.00**	**0.00**	**0.00**	$ **0**	$
2. **Julika Mimkes - Project Manager**	**0.00**	**0.00**	**0.00**	**168,000**	
3.					
4.					
5.					
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	**0.00**	**0.00**	**0.00**	**0**	
7. (**2**) TOTAL SENIOR PERSONNEL (1 - 6)	**0.00**	**0.00**	**0.00**	**168,000**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL ASSOCIATES	**0.00**	**0.00**	**0.00**	**0**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	**0.00**	**0.00**	**0.00**	**0**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**6**) UNDERGRADUATE STUDENTS				**25,500**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**193,500**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**0**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**193,500**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**0**	
2. FOREIGN				**15,000**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**4,000**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**0**	
TOTAL OTHER DIRECT COSTS				**4,000**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**212,500**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
TOTAL INDIRECT COSTS (F&A)				**10,625**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**223,125**	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **223,125**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
Eberhard R Hilf

ORG. REP. NAME*
Julika Mimkes

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

C ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

Budget Justification Page

International Digital Library Interoperability for Physics E-learning Objects
Budgets for the Group UOl, Oldenburg All calculations in EUROS
Personnel

1 person BAT-West IIa for three years (about 56,000 euro per year)

Scientist, experienced in metadata, databases, elearning objects, management, and organisation of the UOl part in the project.

2 students: each 40 hours a month for three years (about 8500 euro per year)

Experienced students (Wissenschaftliche Hilfskraefte) for programming, database management, elearning objects collection and evaluation, metadata tagging.

Travel

In total 5,000 euro per year
Travel to the international partners is paid by the travelling side.
2 visits of both US-partners: flights 2 times: 700 euro; 2 times two weeks 1,400 euro .
Thus 2,800 euro

2 international conferences with own active contributions:
2 times 700 euro thus 1,400 euro.

Meeting with the German Partner: 4 times 200 euro, thus 800 euro
Equipment -placed in supplies and services category on budget line

one specialized server-machine with high in/out capabilities 4,000 euro

Annual amount asked to be funded per year is 69,500 euro Thus for three years (Annual plus Equipment) 212,500 euro
Indirect cost 5% of all: 10,625 euro
Total for three years: 223,125 euro

SUMMARY PROPOSAL BUDGET YEAR 1

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION: **Universitat Rostock**

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR: **Christoph Schick**

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-mos. CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Christoph Schick - PI**	**0.00**	**0.00**	**0.00**	$ **0**	$
2.					
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	**0.00**	**0.00**	**0.00**	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	**0.00**	**0.00**	**0.00**	**0**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**1**) POST DOCTORAL ASSOCIATES	**12.00**	**0.00**	**0.00**	**47,000**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	**0.00**	**0.00**	**0.00**	**0**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**2**) UNDERGRADUATE STUDENTS				**8,000**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**55,000**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**0**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**55,000**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**0**	
2. FOREIGN				**5,000**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**1,000**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**0**	
TOTAL OTHER DIRECT COSTS				**1,000**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**61,000**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **(Rate: , Base:)**					
TOTAL INDIRECT COSTS (F&A)				**0**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**61,000**	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **61,000**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME: **Christoph Schick**

ORG. REP. NAME*: **Christoph schick**

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

1 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET YEAR 2

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION: **Universitat Rostock**

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR: **Christoph Schick**

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-mos. CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Christoph Schick - PI**	**0.00**	**0.00**	**0.00**	$ **0**	$
2.					
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	**0.00**	**0.00**	**0.00**	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	**0.00**	**0.00**	**0.00**	**0**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**1**) POST DOCTORAL ASSOCIATES	**12.00**	**0.00**	**0.00**	**47,000**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	**0.00**	**0.00**	**0.00**	**0**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**2**) UNDERGRADUATE STUDENTS				**8,000**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**55,000**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**0**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**55,000**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**0**	
2. FOREIGN				**5,000**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**1,000**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**0**	
TOTAL OTHER DIRECT COSTS				**1,000**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**61,000**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **(Rate: , Base:)**					
TOTAL INDIRECT COSTS (F&A)				**0**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**61,000**	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **61,000**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME: **Christoph Schick**

ORG. REP. NAME*: **Christoph schick**

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INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET YEAR 3

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION: **Universitat Rostock**

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR: **Christoph Schick**

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-mos. CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Christoph Schick - PI**	**0.00**	**0.00**	**0.00**	$ **0**	$
2.					
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	**0.00**	**0.00**	**0.00**	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	**0.00**	**0.00**	**0.00**	**0**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**1**) POST DOCTORAL ASSOCIATES	**12.00**	**0.00**	**0.00**	**47,000**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	**0.00**	**0.00**	**0.00**	**0**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**2**) UNDERGRADUATE STUDENTS				**8,000**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**55,000**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**0**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**55,000**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**0**	
2. FOREIGN				**5,000**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**1,000**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**0**	
TOTAL OTHER DIRECT COSTS				**1,000**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**61,000**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **(Rate: , Base:)**					
TOTAL INDIRECT COSTS (F&A)				**0**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**61,000**	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **61,000**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME: **Christoph Schick**

ORG. REP. NAME*: **Christoph schick**

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INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET

Cumulative

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
Universitat Rostock

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Christoph Schick

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-mos. CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Christoph Schick - PI**	**0.00**	**0.00**	**0.00**	$ **0**	$
2.					
3.					
4.					
5.					
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	**0.00**	**0.00**	**0.00**	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	**0.00**	**0.00**	**0.00**	**0**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**3**) POST DOCTORAL ASSOCIATES	**36.00**	**0.00**	**0.00**	**141,000**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	**0.00**	**0.00**	**0.00**	**0**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**6**) UNDERGRADUATE STUDENTS				**24,000**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**165,000**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**0**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**165,000**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**0**	
2. FOREIGN				**15,000**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**3,000**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**0**	
TOTAL OTHER DIRECT COSTS				**3,000**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**183,000**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
TOTAL INDIRECT COSTS (F&A)				**0**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**183,000**	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **183,000**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
Christoph Schick

ORG. REP. NAME*
Christoph schick

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INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

C ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

Budget Justification Page

Budgets for the Group of Mr Schick, Rostock
1 person BAT-O IIa for three years (about 47,000 EURO per year)
2 students: each 40 hours a month for three years (about 8,000 EURO per year)
Travel: 5,000 EURO per year
Consumables: 1,000 EURO per year

per year ca. 61,000 EURO

total for three years about 183,000 EURO

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: **Gerd Kortemeyer**

Other agencies (including NSF) to which this proposal has been/will be submitted.

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: **International Digital Library Interoperability for Physics E-learning Objects**

Source of Support: **National Science Foundation**

Total Award Amount: $ **571,411** Total Award Period Covered: **01/01/03 - 12/31/05**

Location of Project: **Michigan State University**

Person-Months Per Year Committed to the Project. Cal:**1.20** Acad: **0.00** Sumr: **0.00**

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: **Web Mediated Push Technology Toolkit for the NSDL; A Pilot Project in Teacher Professional Development**

Source of Support: **National Science Foundation**

Total Award Amount: $ **499,859** Total Award Period Covered: **01/01/03 - 12/31/04**

Location of Project: **Michigan State University**

Person-Months Per Year Committed to the Project. Cal:**2.10** Acad: **0.00** Sumr: **0.00**

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: **RET Supplement; ITR/IM: Investigation of a Model for Online Resource Creation and Sharing in Educational Settings**

Source of Support: **National Science Foundation**

Total Award Amount: $ **29,938** Total Award Period Covered: **07/01/02 - 06/30/03**

Location of Project: **Michigan State University**

Person-Months Per Year Committed to the Project. Cal:**0.00** Acad: **0.00** Sumr: **0.00**

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: **RET Supplement; ITR/IM: Investigation of a Model for Online Resource Creation and Sharing in Educational Settings**

Source of Support: **National Science Foundation**

Total Award Amount: $ **32,500** Total Award Period Covered: **09/15/01 - 08/31/02**

Location of Project: **Michigan State University**

Person-Months Per Year Committed to the Project. Cal:**0.00** Acad: **0.00** Sumr: **0.00**

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: **Cross Integration Supplement; ITR/IM: Investigation of a Model for Online Resource Creation and Sharing in Educational Settings**

Source of Support: **National Science Foundation**

Total Award Amount: $ **76,054** Total Award Period Covered: **09/05/01 - 08/31/02**

Location of Project: **Michigan State University**

Person-Months Per Year Committed to the Project. Cal:**0.00** Acad: **0.00** Summ: **0.00**

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*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: **Gerd Kortemeyer**

Other agencies (including NSF) to which this proposal has been/will be submitted.

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: **ITR/IM: Investigation of a Model for Online Resource Creation and Sharing in Educational Settings**

Source of Support: **National Science Foundation**

Total Award Amount: $ **2,055,000** Total Award Period Covered: **09/15/00 - 09/14/05**

Location of Project: **Michigan State University**

Person-Months Per Year Committed to the Project. Cal: **2.00** Acad: **0.00** Sumr: **0.00**

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Summ:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: **Edwin Kashy**

Other agencies (including NSF) to which this proposal has been/will be submitted.

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: **International Digital Library Interoperability for Physics E-learning Objects**

Source of Support: **National Science Foundation**

Total Award Amount: $ **571,411** Total Award Period Covered: **01/01/03 - 12/31/05**

Location of Project: **Michigan State University**

Person-Months Per Year Committed to the Project. Cal:**0.00** Acad: **0.00** Sumr: **0.00**

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: **ITR/IM: Investigation of a Model for Online Resource Creation and Sharing in Educational Settings**

Source of Support: **National Science Foundation**

Total Award Amount: $ **2,055,000** Total Award Period Covered: **09/15/00 - 09/14/05**

Location of Project: **Michigan State University**

Person-Months Per Year Committed to the Project. Cal:**0.00** Acad: **0.00** Sumr: **0.00**

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: **RET Supplement; ITR/IM: Investigatin of a Model for Online Resource Creation and Sharing in Educational Settings**

Source of Support: **National Science Foundation**

Total Award Amount: $ **29,938** Total Award Period Covered: **07/01/02 - 06/30/03**

Location of Project: **Michigan State University**

Person-Months Per Year Committed to the Project. Cal:**0.00** Acad: **0.00** Sumr: **0.00**

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: **RET Supplement; ITR/IM: Investigatin of a Model for Online Resource Creation and Sharing in Educational Settings**

Source of Support: **National Science Foundation**

Total Award Amount: $ **32,500** Total Award Period Covered: **09/15/01 - 08/31/02**

Location of Project: **Michigan State University**

Person-Months Per Year Committed to the Project. Cal:**0.00** Acad: **0.00** Sumr: **0.00**

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Summ:

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*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

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Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: **Thomas Krichel**

Other agencies (including NSF) to which this proposal has been/will be submitted.

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: **International Digital Library Interoperability for Physics E-learning Objects**

Source of Support: **National Science Foundation**

Total Award Amount: $ **571,411** Total Award Period Covered: **01/01/03 - 12/31/05**

Location of Project: **Long Island University - CW Post Center**

Person-Months Per Year Committed to the Project. Cal: **4.50** Acad: **0.00** Sumr: **0.00**

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Summ:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

 USE ADDITIONAL SHEETS AS NECESSARY

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: **Michael Seadle**

Other agencies (including NSF) to which this proposal has been/will be submitted.

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: **Virtual Artifact Laboratory**

Source of Support: **Institute for Museum and Library SVCS**

Total Award Amount: $ **126,930** Total Award Period Covered: **10/01/02 - 09/30/05**

Location of Project: **Michigan State University**

Person-Months Per Year Committed to the Project. Cal:**1.20** Acad: **0.00** Sumr: **0.00**

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: **Making of Modern Michigan**

Source of Support: **Institute for Museum and Library SVCS**

Total Award Amount: $ **456,642** Total Award Period Covered: **10/01/02 - 09/30/05**

Location of Project: **Michigan State University**

Person-Months Per Year Committed to the Project. Cal:**1.80** Acad: **0.00** Sumr: **0.00**

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: **Accessing African Scholary Journals: Sustainable Electronic Publishing and Indexing of African Journals Through Interna**

Source of Support: **U.S. Department of Education**

Total Award Amount: $ **135,000** Total Award Period Covered: **10/01/01 - 09/30/02**

Location of Project: **Michigan State University**

Person-Months Per Year Committed to the Project. Cal:**1.20** Acad: **0.00** Sumr: **0.00**

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: **A National Gallery of the Spoken Word**

Source of Support: **National Science Foundation**

Total Award Amount: $ **893,130** Total Award Period Covered: **09/01/01 - 08/31/02**

Location of Project: **Michigan State University**

Person-Months Per Year Committed to the Project. Cal:**1.20** Acad: **0.00** Sumr: **0.00**

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: **Feeding America; The Historic American Cookbooks Project**

Source of Support: **Institute for Museum and Library SVCS**

Total Award Amount: $ **200,677** Total Award Period Covered: **10/01/01 - 09/30/03**

Location of Project: **Michigan State University**

Person-Months Per Year Committed to the Project. Cal:**1.20** Acad: **0.00** Summ: **0.00**

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*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: **Michael Seadle**

Other agencies (including NSF) to which this proposal has been/will be submitted.

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: **International Digital Library Interoperability for Physics E-learning Objects**

Source of Support: **National Science Foundation**

Total Award Amount: $ **571,411** Total Award Period Covered: **01/01/03 - 12/31/05**

Location of Project: **Michigan State University**

Person-Months Per Year Committed to the Project. Cal: **1.20** Acad: **0.00** Sumr: **0.00**

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Summ:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

 USE ADDITIONAL SHEETS AS NECESSARY

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: **Eberhard Hilf**

Other agencies (including NSF) to which this proposal has been/will be submitted.

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: **International Digital Library Interoperability for Physics E-learning Objects**

Source of Support: **National Science Foundation**

Total Award Amount: $ **223,125** Total Award Period Covered: **01/01/03 - 12/31/05**

Location of Project: **University of Oldenburg**

Person-Months Per Year Committed to the Project. Cal:**0.00** Acad: **0.00** Sumr: **0.00**

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: **OAD Open Archives Distributed: Distributed services for physicists and graduate students**

Source of Support: **Deutsche Forschungsgemeinschaft DFG / National Science Found**

Total Award Amount: $ **0** Total Award Period Covered: **01/01/00 - 01/01/00**

Location of Project: **University of Oldenburg**

Person-Months Per Year Committed to the Project. Cal:**0.00** Acad: **0.00** Sumr: **0.00**

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: **PMM Physik Multimedia(l) Lehr- und Lernmodule fur das Studium der Physik im Nebenfach**

Source of Support: **Bundesministerium fur Bildung und Wissenschaft, Forschung un**

Total Award Amount: $ **0** Total Award Period Covered: **01/01/00 - 01/01/00**

Location of Project: **University of Oldenburg**

Person-Months Per Year Committed to the Project. Cal:**0.00** Acad: **0.00** Sumr: **0.00**

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: **SINN Suchmaschinennetzwerk im Internationalen Naturwissenschaftlichen Netz Deutsches Forschungsnetz**

Source of Support: **Deutsches Forschungsnetz DFN**

Total Award Amount: $ **0** Total Award Period Covered: **01/01/00 - 01/01/00**

Location of Project: **University of Oldenburg**

Person-Months Per Year Committed to the Project. Cal:**0.00** Acad: **0.00** Sumr: **0.00**

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Summ:

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*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: **Julika Mimkes**

Other agencies (including NSF) to which this proposal has been/will be submitted.

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: **International Digital Library Interoperability for Physics E-learning Objects**

Source of Support: **National Science Foundation**

Total Award Amount: $ **223,125** Total Award Period Covered: **01/01/03 - 12/31/05**

Location of Project: **University of Oldenburg**

Person-Months Per Year Committed to the Project. Cal:**12.00** Acad: **0.00** Sumr: **0.00**

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: **OAD Open Archives Distributed: Distributed services for physicists and graduate students**

Source of Support: **Deutsche Forschungsgemeinschaft DFG / National Science Found**

Total Award Amount: $ **0** Total Award Period Covered: **01/01/00 - 01/01/00**

Location of Project: **University of Oldenburg**

Person-Months Per Year Committed to the Project. Cal:**0.00** Acad: **0.00** Sumr: **0.00**

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: **PMM Physik Multimedia(l) Lehr- und Lernmodule fur das Studium der Physik im Nebenfach**

Source of Support: **Bundesministerium fur Bildung und Wissenschaft, Forschung un**

Total Award Amount: $ **0** Total Award Period Covered: **01/01/00 - 01/01/00**

Location of Project: **University of Oldenburg**

Person-Months Per Year Committed to the Project. Cal:**0.00** Acad: **0.00** Sumr: **0.00**

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: **SINN Suchmaschinennetzwerk im Internationalen Naturwissenschaftlichen Netz**

Source of Support: **Deutsches Forschungsnetz**

Total Award Amount: $ **0** Total Award Period Covered: **01/01/00 - 01/01/00**

Location of Project: **University of Oldenburg**

Person-Months Per Year Committed to the Project. Cal:**0.00** Acad: **0.00** Sumr: **0.00**

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Summ:

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*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

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Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: **Christoph Schick**

Other agencies (including NSF) to which this proposal has been/will be submitted.

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: **International Digital Library Interoperability for Physics E-learning Objects**

Source of Support: **National Science Foundation**

Total Award Amount: $ **0** Total Award Period Covered: **01/01/03 - 12/31/05**

Location of Project: **University of Rostock**

Person-Months Per Year Committed to the Project. Cal:**0.00** Acad: **0.00** Sumr: **0.00**

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: **Heat Capacity Spectroscopy i nteh Melting and Crystallization Range of Polymers**

Source of Support: **Deutsche Forschungsgemeinschaft (DFG)**

Total Award Amount: $ **100,000** Total Award Period Covered: **12/01/99 - 11/30/02**

Location of Project: **University of Rostock**

Person-Months Per Year Committed to the Project. Cal:**5.00** Acad: **0.00** Sumr: **0.00**

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: **Early Stages of Polymer Crystallization**

Source of Support: **Deutsche Forschungsgemeinschaft (DFG)**

Total Award Amount: $ **200,000** Total Award Period Covered: **09/01/01 - 08/31/05**

Location of Project: **University of Rostock**

Person-Months Per Year Committed to the Project. Cal:**5.00** Acad: **0.00** Sumr: **0.00**

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: **Physics Multimedial**

Source of Support: **BMBF**

Total Award Amount: $ **320,000** Total Award Period Covered: **04/01/01 - 12/31/03**

Location of Project: **University of Rostock**

Person-Months Per Year Committed to the Project. Cal:**6.00** Acad: **0.00** Sumr: **0.00**

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: **Discovery of Ways to Improve Power-Compensated DSC by Modeling the Heat Flows Inside the DSC Cup**

Source of Support: **Perkin Elmer Instruments**

Total Award Amount: $ **70,000** Total Award Period Covered: **01/01/02 - 12/31/02**

Location of Project: **University of Rostock**

Person-Months Per Year Committed to the Project. Cal:**2.00** Acad: **0.00** Summ: **0.00**

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*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Laboratory for
Instructional
Technology in
Education

123 North Kedzie Labs
Michigan State University
East Lansing, MI 48824

(517) 432-5468
http://www.lite.msu.edu/
lite@lite.msu.edu

Laboratory Facility:

The LITE Lab is the educational multimedia development and service facility of the College of Natural Science at Michigan State University. It is housed in the Division of Science and Mathematics Education, which is the organizational bridge between the College of Natural Science and the College of Education.

The LITE Lab will be used as the development facility for the LON-CAPA software components under this grant. The LITE Lab will also provide office and conference space for the project.

Current Staff:

Guy Albertelli, Specialist
Felicia Berryman, Programmer Analyst
Matthew Hall, Specialist
Helen Keefe, Program Manager
James Keller, Technician
Gerd Kortemeyer, Director
Behrouz Minaei, Graduate Student
Alexander Sakharuk, Postdoctoral Fellow
Jason Stredwick, Programmer

Computing Facilities:

Server machines under UNIX, Linux and Windows NT/2000 Server
Workstations under Linux, MacOS, Windows 95/98, Windows NT/2000 Workstation and Linux
Dedicated gigabit network uplink, two dedicated network segments.

Management Plan

1 Tasks of the Partners

While Long Island University (LIU) will develop the design of the collection in general, together with UOl, MSU and UOl will couple their existing services and identify elearning objects which have the same content but in the different context of US or German teaching culture, respectively. The University of Rostock (URo) and MSU will focus on the most needed sector of exercises.

1.1 Long Island University

The work at Long Island University will be carried out in the Palmer School of library and information science by Dr. Thomas Krichel. He will design the collection mechanisms for the elearning objects and their associated metadata. He will work on the design of general procedures of collaborative database building in distributed environment. He will commission implementation software, from consultants. He will supervise the consultants' work.

Thomas Krichel will be working in the release time provided by the University. These are 2 3-credit courses per semester, i.e. six teaching credits per semester. During the summer vacation, Dr. Krichel will be working as a volunteer for the project.

1.2 University of Rostock

The work carried out at the University of Rostock is aimed to investigate exercise (home work) tools to define similarities and differences between the American and German web-based e-learning systems. To allow both sides to make use of the different systems or of parts (atoms) it is essential to categorize the already existing material by means of metadata and related tools.

The group at URo represents the user-side of e-learning objects rather than the specialist in e-learning technology. The group will therefore contribute to the project by testing, evaluation and exploration of similarities and differences of existing e-learning systems, especially in the field of exercise modules for homework and self-testing. Also the activities will start from the view point of a user. Giving undergraduate physics courses, URo does have some experience in using and developing exercise modules for homework and self-testing. The group is responsible for the development, test and evaluation of the exercise module in the PMM collaboration. It is the aim of the URo participation in the present project to effectively disseminate the actually available 200 exercise tasks in the PMM module and to allow a transfer to similar e-learning systems. On the other hand URo wants to allow users of PMM to select and to incorporate relevant and appropriate tasks from other e-learning collections, like LON-CAPA, into their classes. Here from the point of view of a user the criteria will be defined which have to be used by the search engines and meta data to allow an effective

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selection of useful tasks from the great number of material already available on the WWW.
In a first step (first year) the exercise modules at MSU (LON-CAPA) and URo (PMM) in the field of classical mechanics will be investigated. Tools have to be developed which allow potential users of the systems to find and to identify tasks which meet the needs of the actual course.

The courses may formally be very similar (mechanics) but for the different style of teaching a method has to be found out to use the overwhelming reservoir of already existing home work tasks on both sides of the Atlantik. The existing e-learning systems are mostly developed independently of each other. A typical example is the LON-CAPA project in the US and the modules set up by the PMM collaboration in Germany. They both focus partly on the same clientele. To combine forces it is necessary to build up bridges which allow an easy but organized transfer of information (e.g. in regard to home work tasks) between both and similar systems. MSU and URo will, in conjunction with UOl and LIU, define the necessary gateways and categorization standards (second year).

In the third year the developed system to exchange information and home-work tasks between LON-CAPA and PMM will be made available to users of both systems. The experience gained will be used to improve the meta data and harvesting systems to support the development of a more general system covering more than LON-CAPA and PMM.

1.3 University of Oldenburg

The group in Oldenburg (UOl) is going to work on the technical and social interoperability of the two physics systems LON-CAPA and physik multimedial.

While the group in Rostock (URO) cares about exercises, UOl is going to investigate the interoperability of self-study units and data bases of the project. UOl is going to work on the German side of technical interoperabilty, described in sections 3 and 4. To start with, a common set of metadata of LON-CAPA and physik multimedial has to be found. Since both groups use metadata based on international standards, Dublin Core and IEEE LOM, a common set of metadata is likely to be found. Since MSU is working on the task to implement LON-CAPA into NSDL by using OAi metadata, defined by NSDL, this standard should be implemented to physik multimedial as well. Today, UOl is planning to use a HARVEST search engine combined with LiLi to find the distributed international physics elearning content. Together with aggregated services, developed by LIU, this service can be enhanced and improved.

Lectures, exercises, books and self-study units in the field of classical mechanics will be investigated to find similarities and differences between the American and German web-based e-learning systems. Compared to the research in this field of URo, differences of East and West Germany and of MSU differences to the US are going to be obtained.

After the agreements on the technical, social and legal interoperability, the

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work for coding for the distributed repositories is going to take place in Oldenburg.

1.4 Michigan State University

The group at MSU is going to work with the Oldenburg group on interoperability between the elearning platforms and cataloging schemes of LON-CAPA, physik multimedial, and LiLi. In addition, through the NSDL currently under development, they will attempt to further cross-intergrate the German collaborators with the NSDL.

The group is also going to work closely with the Rostock group on the interoperability.

In addition, Michael Seadle will be researching the sociological and legal issues of this German/American collaboration, and the project will implement working models for this exchange.

2 Timeline

Project Starting Date: The 2 weeks will be used for staffing and training purposes.

2.1 First Year

Development of sharable elearning environment

- Identify and categorize elearning objects at both US and German systems *URo, UOl, and MSU*
- Determine metadata differences *URo, UOl, and MSU*
- Determine criteria for metadata usage *URo, UOl, and MSU*
- Determine adaptations needed to both elearning platforms, code additional software handlers *MSU and UOl*
- Database field definition and crosswalks *MSU and UOl*
  - Identify and define items (atoms, threads, etc.)
  - Identify and define relationships among items
  - Code databases and access software
- Testing and Evaluation *MSU and UOl*
- Identify and hire external evaluator *MSU and UOl*
- Perform Pilot implementation *MSU and UOl*

Development of Aggregative Data & Services *LIU and UOl*

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- Identify contributors
- Develop contributor profiles
- Research and develop incentives
- Develop strategies for providing incentives to specific contributors
- Research identification strategies and authority hierarchies
- Design aggregative database *LIU, MSU and UOl*
  - Identify and define items and relationships *LIU, MSU and UOl*
  - Design interfaces *LIU, MSU and UOl*
- Design models for identification strategies and authority hierarchies *LIU*
- Identify and commission software consultants

2.2 Second Year

- Define necessary gateways and categorization standards *URo, UOl, and MSU*
- Investigate models regarding copyright issues *MSU*
- Pilot models for aggregative identification strategies and authority hierarchies *LIU*

Social Interoperability Research (SIR) *MSU, UOl, and URo*

- Determine methodologies and protocols
- Develop protocols and surveys
- Distribute surveys to students and faculty at all sites
- Begin preliminary analysis of data

2.3 Third Year

- Implement shared database of elearning objects with sufficient level of interoperability *UOl and MSU*
- Prototypes of services available to public *UOl and MSU*
- Distribute SIR surveys to students and faculty at all sites *MSU*
- Continue analysis of SIR data and report findings *MSU*
- Analyze and report findings from aggregative services and evaluation research *LIU*

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3 Management and Reporting

Michigan State University will be the administrative lead institution.

3.1 Project Management

A project manager will be hired part-time to manage and co-ordinate the project. The project manager will work with the PIs of all the sites, coordinating work, scheduling visits, and ensuring that all milestones are being met. The project manager will be responsible for collecting status information and reporting it back to all participants in a timely manner. Decisions that are directly related to MSU policies or have an effect beyond the duration of this grant proposal will be coordinated with the Vice Provost for Libraries, Computing and Technology, and handled in accordance with policies set forth by the MSU Board of Trustees. The other project partners will identify equivalent contacts within their respective administrative structures.

3.2 Management and Reporting Responsibility

Overall management and reporting responsibilities will be carried out by Gerd Kortemeyer. MSU will work in close collaboration with the other partners.

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