Project Description

1 Overview

1.1 Purpose of the Workshop

The NSF initiative of *International Research and Education* (Planning Visits and Workshops Program Solicitation NSF 04-035) will lead researchers, professionals and students to a research and teaching atmosphere where topics of international significance and interest are presented. This prompted the team to synthesize engineering technology, ref. [4], architectural issues, ref. [1], and societal concerns within the context of sustainable tourism in a developing country. It has been widely perceived that during the next decade the Angkor temple complex in Cambodia will become one of the most sought after tourist destinations due to the cultural and architectural marvels the region presents.

1.1.1 Cambodian Government Initiative

Under the auspices of the Cambodian Government the *APSARA* agency has been successful in securing foreign grants from various countries, notably Japan, France and the US. Engineers and architects (domestic and foreign) have collaborated actively in field work restoring and protecting the 1200 year old structures (e.g., temples, walls, bridges, roadways). This research team feels that such a lively environment will furnish young US engineers and scientists with a unique traininng opportunity to assume future leadership roles.

1.1.2 Interest of the US State Department

The US Embassy in Phnom Penh, Cambodia, invited the principal investigator to a meeting on September 24, 2004. The embassy staff, following the lead of Ambassador Charles Ray, has initiated joint research and training programs that involve US and Cambodian scientists and engineers. To our great satisfaction, this idea fits right in to the NSF initiative of training Global Scientists and Engineers. The USAID Mission Director in Cambodia, Jonathan S. Addleton, has requested the principal investigator to formally present specific issues that combine engineering and socio-economic planning related to future research and teaching.

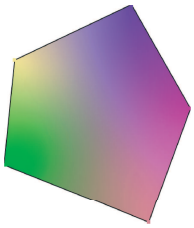
After the workshop the team anticipates research grants from other US agencies e.g., the US State Department, NIH and NEA.

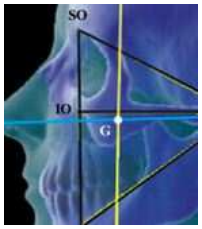
2 Prior NSF sponsored research of PI Dasgupta

Full publication references are in the supplementary documents.

2.1 NSF-CMS 9820353: *Duration:* 8/1999-7/2001, *Support:* $ 130,000

Convex Polygonal Finite Macroelements: Closed-Form Kinematics and Exact Quadrature

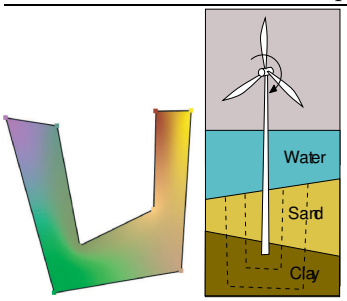




Shape functions for any convex n-sided polygon in two dimensions can be construed as rational polynomials. The shape functions can be derived in closed form by applying the requirements of the patch test generally. The derivation can be performed systematically in an automated fashion using computer algebra, and the resulting shape function codified specifically into a numerical scheme. The formulation is invaluable for capturing geometric stochasticity and modeling of randomly varying media. It has similarly been applied to the study of biological entities whose behavior is governed by a very limited set of data. **Publications:** 6 (Journal), 3 (Conf.)

2.2 NSF-CMS 0202232: *Duration:* 6/2002 - 8/2004 *Support:* $ 275,104

Concave Finite Element Shape Functions



Tessellation of a concave domain into separate convex finite elements disrupts precisely the important geometrical effect which concavity is designed to capture. The peakedness of the gradient field is not captured by the tessellated model. As a result, displacement based finite elements are unstable around a reentrant node. Similarly, if the finite elements model elastic behavior, the stress intensity is not captured. The developed concave element formulation is general and applies to any convex or concave polygon. It does not require any tessellation and can capture the singularity of the gradient field. **Publications:** 3 (Journal), 2 (Conf.), 1 (PhD Thesis)

2.3 NSF-INT-0233570: *Duration:* 2/1/2003 - 2/28/2006 *Support:* $16,920

US-France Cooperative Research: Engineering Shape Calculation for Surgery, Biology and Anthropology

This three-year award for US-France collaboration involves researchers and students at Columbia University and the University of Bordeaux. Gautam Dasgupta in the US and José Braga in France lead this interdisciplinary team of mechanical engineers and computer scientists. This research project addresses development of optimized computational codes, which can be employed in morphometric research in biology and anthropology. The French team brings to this collaboration a focus on fundamental biological and anthropological issues and expertise in clinical implications in cranio-facial surgery and orthodontic treatments. This award represents the US side of parallel proposals to the NSF and the CNRS. The project will stimulate more accurate evaluation and efficient design of cranio-facial surgery and orthodontic treatments related to maxillo-facial structure. Braga, Holloway, Thackeray and Moss-Salentijn had a successful meeting at Columbia University at a Symposium honoring Dr. Melvin Moss. The presentations emphasized the influence of Dr. Moss' Functional Matrix Hypothesis on cranio-facial surgery, orthodontics and anthropology (*vide* `http://www.civil.columbia.edu/MossSymposium`).

2.4 NSF-CMS-0350433: *Duration:* 10/15/2003 - 9/30/2004 *Support:* $ 14,788

Workshop: Nano, Continuum, Material and Computational Mechanics

At the forum computational techniques in engineering mechanics, from the continuum to micro- to nano-level will be synthesized. Each play an essential role in all branches of emerging technologies. A more accurate evaluation and more efficient design of numerical experimentation will be discussed. In particular, to account for scale effects, methods to replace heuristic schemes and associated computational strategies by fundamental formulations based on the underlying physics of the problem will be formulated. Subtle secondary effects, which are currently assessed by subjective procedures, constituted the central theme of the workshop. Mechanics researchers have been assessing the needs of their colleagues working on emerging technologies — micro- and nano-mechanics research in a variety of fields including biomedical engineering. Such combined team efforts during workshops invariably lead to designing optimized algorithms appropriate for developing research projects across a wide field of engineering science.

3 Participants and activities

3.1 Workshop Participants

3.1.1 Faculty participation

The intent of this workshop is to bring together a diverse group of engineers and scientists who will address both technical and societal issues. The main speakers will be researchers from the US, Cambodia, and Thailand. The travel and daily allowances for the US participants are sought in this grant. The other participants will have their own support outside of US Government funding.

3.1.2 Student participation

Graduate and undergraduate students from the US and abroad will attend all sessions of the workshop. They will be encouraged to make individual presentations (though this is not mandatory). All students will participate in discussion groups and question/answer sessions where each individual supported by this grant will make a short presentation.

3.2 Topics

Adhering to the conclusions of the December 2003 workshop at the AIT, Thailand, 50% of the effort will be focused on engineering issues, 25% on architecture and 25% on social and environmental concerns.

3.2.1 Sessions

1. Engineering Mechanics
   (a) Continuum mechanics (Dasgupta – M*)
   (b) Computational mechanics (Worsak – M)
   (c) Nanomechanics (Dutta – M)
2. Architecture
   (a) Historic sites (Kimreth – M)
   (b) Modeling and rendering (Sanchez – M*)
   (c) Conservation and preservation (McKee – F*)
3. Social Issues
   (a) Technology, education & environment (De Laet – F*)
   (b) Fabric industry (Angus – F*)
   (c) Public health (Das – F*)

Letters "M" and "F" after last names indicate male and female. The grant seeks support for the participants indicated by * — two male and four female US members.

3.3 Student Activities

3.3.1 Global experiences

The current state of engineering mechanics is principally focused on material modeling, numerical simulation, and experimental validation.

The historic monuments of Angkor provide a challenging venue where researchers can study the macro consequences of globalization in a developing country alongside fundamental problems of degradation of structural foundations from ground water flow.

This concern is prompted by the fact that as more and more tourism-related construction and investment (e.g., hotels, highways, amusement centers) strains the water supply and sanitation/transportation services, the overall regional ground water flow may adversely affect the integrity of the foundations to support Angkor's massive stone walls and temples. The proposed field experience will provide a unique opportunity for students to observe how the modeling and simulation theories are validated in actual practice.

Within global engineering studies, commercial geotechnical companies (e.g., Schlumberger) are continuously searching for engineers and scientists to undertake challenges in many parts of the world.

3.3.2 Field work

The students will meet the engineering management personnel from the **J**apanese Government Team for **S**afeguarding **A**ngkor (**JSA**), and study the current conservation plan for Angkor Wat, one of largest and most spectacular temples at the heritage site. The office of the Engineers for the **JSA** committed to provide the principal investigator detailed restoration/construction drawings and schedules, and describe future projects.

The undergraduate students of the **B**uild **B**right **U**niversity, University of Phnom Penh, and ***I**nstitut de **T**echnologie du **C**ambodge* will meet with their US counterparts and share classroom and materials laboratory experiences. Professor Sok Khom of ***I**nstitut de **T**echnologie du **C**ambodge*, demonstrated to the principal investigator the scope of cooperation that could lead to student exchange and research publications.

3.3.3 Graduate/Undergraduate students

Ms. Brigitte Cook, an MS student at Columbia's School of Architecture, has already been selected. University of Florida will nominate one graduate student in environmental engineering. Two undergraduate students will be selected by Ms. McKee; at least one will be a female.

3.4 Participants

No.	Name	Specialization	Status	Note-1	Gender
1	Dasgupta, G	Engineering Mechanics	Professor	Columbia Univ.; PI	M
2	De Laet, M.	Anthropology/Sci. & Tech.	Assoc. Professor	Harvey Mudd; co-PI	F
3	Angus, F.	Human Ecology	Asst. Professor	Univ. Wisconsin, Mad.	F
4	Sanchez, J.	Computer Graphics	Industry	Contour Graphics, NYC	M
5	Das, M.	Public Health	NYC Official	Medical Doctor	F
6	McKee, K.	Tourism; Architecture	PhD Candidate		F
7	Cook, B.	Architecture-Preservation	MS Student	Columbia U.	F
8		Environmental Engineering	MS Student	U. Florida	
9		Engineering	Undergraduate	U. Mississippi	
10		Social Sciences	Undergraduate	U. Arkansas	

Table 1: US Participants (funded by the workshop)

No.	Name	Specialization	Affiliation
1	Pattnaik, A.	Engineering Administrator	**B**uild **B**right **U**niversity
2	Varachit, I.	Rector	**B**uild **B**right **U**niversity
3	Sok K.	Structural Engineering	***I**nstitut de **T**echnologie du **C**ambodge*
4	Sothan, N.	Director	*Institut de Technologie du Cambodge*
5	TBA	Environmental Enggr.	University of Phnom Penh
6	TBA	Architecture	University of Phnom Penh
7	Kimreth, M.	Field Engineer	*World Monuments Fund*
8	Harvey, A.	Project Manager	*World Monuments Fund*
9	Hirai, T.	Project Manager	*Japanese Team Safeguarding Angkor*
10	Akazawa, Y.	Project Engineer	*Japanese Team Safeguarding Angkor*
11	TBA	Environmental Engineering	Government of Cambodia
12	TBA	APSARA (Preservation)	Government of Cambodia
13	TBA	USAID	US Embassy
14	TBA	TBA	US Embassy

Table 2: Local Participants (not funded by the project)

4 Preparation for Workshop

4.1 Reason for workshop

The workshop will provide an opportunity to discuss recent research on structural engineering, architecture and quantification of sustainable policies, ref. [8]. There is no academic society or professional organization to embrace such a broad field. The integrated knowledge cannot be obtained at any (engineering or liberal arts) meeting. The mutual exchange will educate participants on their colleagues' fields. The outcome will expose global scientists and researchers, and undergraduates, MS and PhD students to pedagogy that combines theoretical studies with field observations.

The following trips were funded by non-US Government agencies.

4.1.1 Visit to Siem Reap (Angkor) in December 2003

The principal investigator and McKee were funded by a Columbia University internal grant under the *Academic Quality Fund* program. They met with the **W**orld **M**onuments **F**und (*WMF*) management, architects and field engineers. The *WMF* organized field trips in the Angkor temple complex and presented the architectural conservation and structural engineering modeling problems they have encountered.

The principal investigator initiated a software exchange program and provided computing assistance to the *WMF* engineers. McKee initiated studies of the historic sites from the management viewpoint and tied the engineering and the social aspects together that evolved to be the central theme of this workshop.

4.1.2 Visit to Angkor and Phnom Penh in July 2004

Following partial supports from Kagawa University, Japan and the **A**sian **I**nstitute of **T**echnology (*AIT*), Thailand, the principal investigator visited ***I**nstitut de **T**echnologie du **C**ambodge* and **B**uild **B**right **U**niversity in Phnom Penh. Professor Sok Khom, a structural mechanics graduate from the *AIT* who teaches in both these Phnom Penh engineering institutes, hosted the principal investigator for special seminars on structural engineering research and training related to historic sites.

The Rector of **B**uild **B**right **U**niversity completed a PhD dissertation on technical and socio-economic developments of Angkor. In a two day symposia (organized by the Rector) the idea of the proposed workshop emerged.

4.1.3 Visit to Phnom Penh and Angkor in September 2004

Funded by the Optimization Society of Japan the PI will visit Phnom Penh and Siem Reap (Angkor) from September 21 to September 26. He will be accompanied by Prof. Dutta of *AIT*, Thailand, in Phnom Penh and Siem Reap. They will address a graduate seminar at **B**uild **B**right **U**niversity on *Information Technology* to lay the framework for sessions on engineering and society during the proposed workshop.

Worsak (former Dean), and Barry, Assistant Professor of *AIT* (Civil Engineering) will visit the Siem Reap campus of **B**uild **B**right **U**niversity with the PI to determine civil engineering and material laboratory topics for the US-Cambodian students' workshop sessions.

4.2 Student Research Objectives

4.2.1 Historic Site in Angkor

Cooperative research of the graduate and undergraduate students will focus on devising a methodology for mapping and modeling sustainable development of cultural heritage sites primarily in the Southeast Asia-Pacific Rim region, and specifically at Angkor, which is inscribed on *The World Heritage* List. The complex relationships between humankind and the environment will be analyzed based on the patterns of the past to devise innovative means for present-day management and future planning.

Cultural heritage resources are artifacts in/of the built environment that represent a defined time, place, and culture. They are fragile, irreplaceable archives belonging to our collective identity that demonstrate the history of humanity, artistic mastery, and technological advancement on this Earth. However, tourism and urban development are two pervasive mechanisms changing the complexion of cultural heritage sites worldwide. At present, no quantitative (analytical and technical) methodology exists for managing sustainable growth of these resources. Tourism creates and promotes economic growth at cultural sites and surrounding regions, necessitating sustainable development and design if both the local population and tourism industry are to thrive. For example, at Angkor a constant influx of tourists and a shift from agriculture to a service-based economy has increased Siem Reap's overall population, creating sprawl and high density. In turn, this change has increased output of greenhouse gases, and solid and water wastes, as well as intensified consumption of energy, food, and water. Conservationists and planners are examining how other changes in the natural and urban environments, with respect to water sources, hydrological cycle, deforestation, utilities, and farming practices, affect the Angkor cultural region. Cultural heritage areas follow the definition of emerging urban environments where:
1) they constitute a unique, densely populated habitat that is environmentally distinct;
2) they exert significant environmental impacts on their immediate surroundings, their hinterlands, and the regions of which they are a part; and
3) they are linked by transportation, trade, and population migration in an interacting system. Within this system, cultural, economic, demographic and political decisions influ-

ence not only the local environment, but also regional environments.

Management is required with respect to infrastructure development, support services, structural integrity of the historic buildings, hazards and risks, and tangible and intangible cultural values. Many government officials believe cultural resources to be local conservation problems. However, by its very nature tourism is a global/globalization issue that becomes a regional issue as urbanization takes hold. Studying a contemporary developing site such as Angkor, which has records of the changes over the last 50 years, allows for quantification of the effects of tourism and urban development on a regional scale.

4.2.2 Research Methodology

The proposed analysis requires an interdisciplinary approach that integrates social theory with engineering, earth and environmental sciences and humanities to encompass:
1) technical procedures of measuring, mapping and visualizing spatial data (Geomatics);
2) determination of the cultural, environmental, and urban dynamics impacting sustainable development;
3) policies for conservation/planning of the built environment, and
4) nondeterministic statistical formulas for predictive modeling of sustainable development.

4.2.3 Preparatory Studies

Designing a methodology that uses remote sensing, geographic information systems, ref.[7] ,and distributed computing technologies will be based on knowledge of the theories and principles underlying urban development, cultural dynamics, and environmental forces. In the end, this quantitative system will allow for better analysis, management, and policy-decisions related to the social and environmental systems that create and define change. Critical reading of *remote sensing technologies* to *regional landscapes of cultural heritage* resources (as in Proceedings from International Symposia on Remote Sensing of Environment (ISRSE)) will be mandatory for both graduate and undergraduate students.

Sample topics for reports are:

1. how radar imagery can be used for resource management
2. broad-scale (multiscalar) spatial analysis
3. comprehensive approach for understanding and identifying the causes and effects of human activity on land use/land cover over time

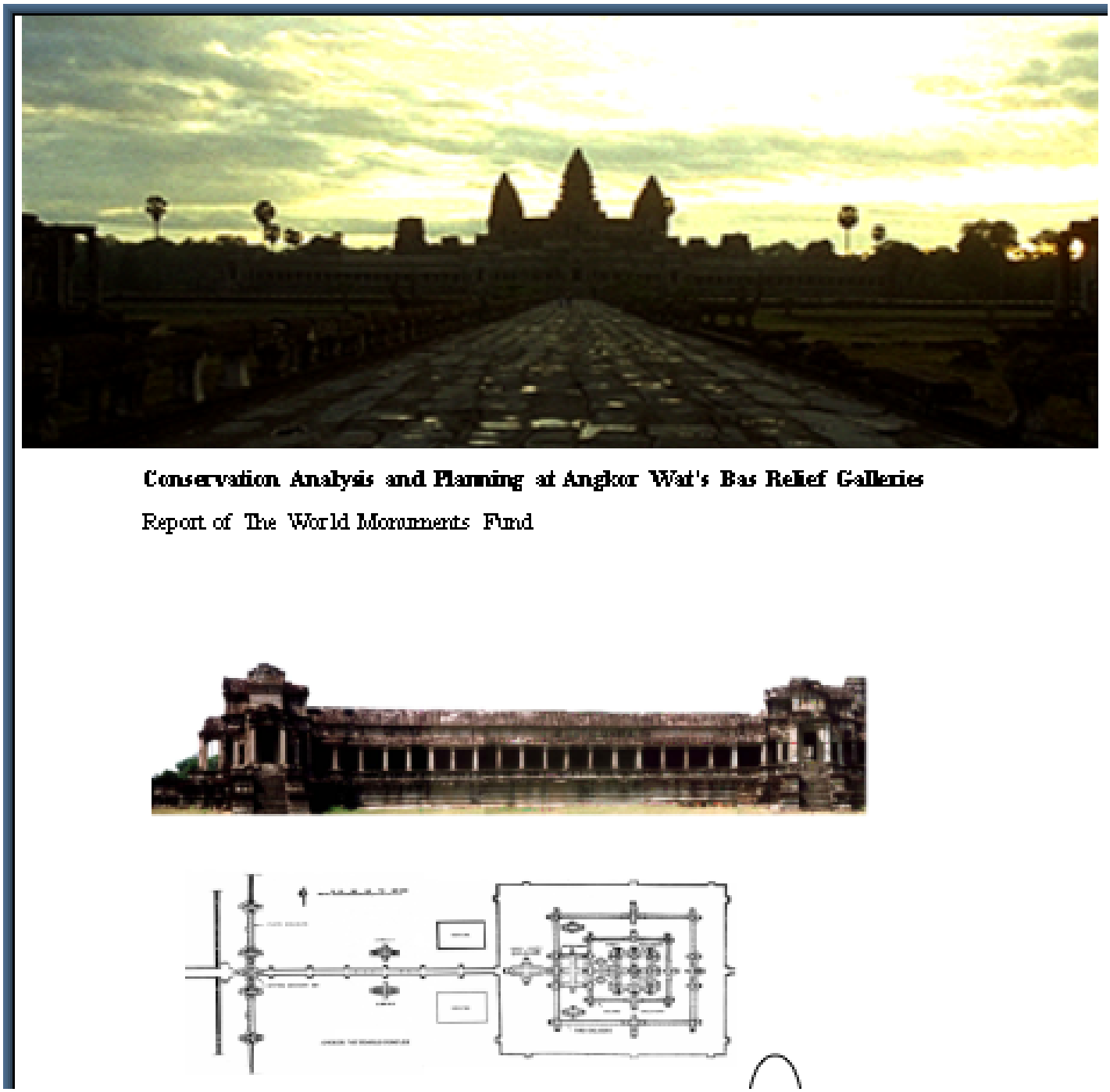


Figure 1: Sample synthesis of *Graphics* and *Structural Analysis* Programs

Students will have access to structural analysis codes (viz., `SAP`), computer graphics modeling and rendering programs (viz., `Maya`); GIS, remote sensing data, and maps; and computation environment (viz., *Mathematica*) during the field trip.

5 Intellectual Merit

The workshop will concentrate on technical as well as policy matters. The structural engineering considerations, especially the development of finite element and boundary element models may not need elaboration. Hence the focus on the innovativeness of the proposed policy analysis model.

5.1 Engineering/architectural issues

Strategies of developing engineering tools for stress analysis of historic structures will be discussed. Sanchez will lead sessions on utilization of engineering CAD drawings in a stress analysis scenario. The implications are far reaching — a computational engine, ref.[12], with computer algebra capabilities is intended to power `Maya` animations, ref.[6].

Another significant session will highlight interactions with Angus' group to provide computer assisted weaving for Cambodia's emerging market of textile designs. Development of a prototype that weaves by downloading graphics from a computer screen will be considered.

De Laet will lead discussions on fiscal constraints for long term development of software to analyze engineering and policy-related problems.

5.2 Policy considerations

Based on *combinatorics of words,* a novel approach is being initiated by the principal investigator and McKee to study the temporal evolution of policy strategies in an algorithmic sense. Hitherto all models yield restricted qualitative output. The model on four word alphabet (described below) will stimulate discussions during the workshop and will be of interest to each member of the group.

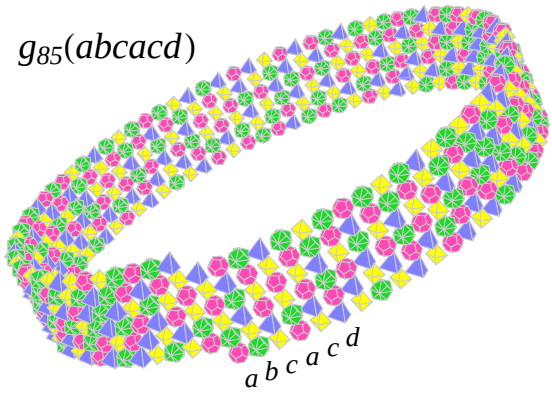


Figure 2: Development of an Abelian Square-free Chain depicting sustainable development parameters: Nutrition (red), Sanitation (green), Education (yellow) and Recreation (blue)

5.2.1 Quantification of sustainability

The morphism (function in the conventional sense of calculus) is denoted by g. Its arguments are initial letters of the chain. The next set of characters are defined by g, and an illustration of rule 85, ref.[5] is in Figure 2. A segment is defined to be Abelian square-free if no two adjacent parts are identical after permutation. Within the context of *combinatorics of words* a strategic layout of the succeeding characters will attribute such (hard to construct) Abelian square-free patterns.

It has been conjectured that during the policy development a sequence of steps (dictated by a morphism g) are followed. The sustainability of the socio-economic model (simplified by the four characters of *nutrition, sanitation, education and recreation* – as the basic building blocks) is depicted by the evolving chain. The degree of compliance to the Abelian square-free characterization furnishes a quantitative measure of sustainability. Hence a quantitative value symbolizes the *path for a policy*.

This application of pure mathematics in socio-economic policy analysis typifies the intellectual merit of this multi-disciplined workshop. An NSF proposal and a PhD dissertation will result based on the recommendations of the participants incorporating classical results from *theoretical computer science* ref.[9].

6 Broader Impact

A- Teaching, training and learning: The workshop will include a variety of topics listed in §3.2, page 3.

(a) Teaching:

a-i McKee will undertake field teaching of graduate and undergraduate students in the areas of architectural conservation and preservation.

a-ii **B**uild **B**right **U**niversity, will host the students at the Angkor (Siem Reap) campus. One of their faculty members, Kimreth, will demonstrate civil engineering and architectural planning and management aspects.

(b) Training:

b-i Field training:
The students will visit the historical sites in the Angkor temple complex.

b-ii Laboratory training:
The students and the faculty members will visit engineering laboratories in

Phnom Penh and Siem Reap.

Pattnaik, **B**uild **B**right **U**niversity's International Program Coordinator will arrange laboratory presentations.

b-iii McKee, the former Lab Manager, Columbia University's Preservation–Conservation program, will undertake specific programs to train the US team and implement future research/teaching opportunities with Cambodian teachers and students.

(c) Learning:
All major research universities have undertaken programs that link engineering with the disciplines of liberal arts. This proposal will provide a unique learning opportunity for the team to develop curricula that adapts civil engineering management to the global economic society.

(d) Discovery:
The role of vegetation in tropical sites as a deterrent of insect borne diseases is an example of applications of computational statistics to discover effects by studying the correlation structures, ref. [3, 11]. This paradigm will be the focus of a *LiveDesign* methodology whose applications in security engineering can be found at:
`http://www.columbia.edu/~gd18/securityEngineering.ppt`

(e) Understanding:
Applications of the theory of complex systems proposed by Wolfram, ref.[13], Shiraki, ref.[10] Chaitin, ref.[2], and Keränen, ref. [5], will be implemented to track the temporal development of sustainable policies.

B- Geographic diversity:

(a) The US faculty members will come from Columbia University (NY), University of Florida (FL), University of Wisconsin (WI) and Harvey Mudd College (CA).

(b) Undergraduate student participants are expected from University of Arkansas and University of Mississippi.

(c) All financially-supported participants are citizens/permanent residents of US.

C- Gender balance:

The proposal makes a request on behalf of ten participants from

the US. Of the six presenters, two are male and four are female. Of two graduate students, one is female, the other has not been finalized. Of two undergraduate students, most likely, one will be female. The students will be selected by the last week of September after initial adjustments for the new semester.

D- Networks and partnerships:

(a) Networks:

a-i: Collaboration with the French speaking university, ***I**nstitut de **T**echnologie du **C**ambodge*, which is partially supported by the French Government, opens up the possibilities of reinforcing the ties developed from the NSF/CNRS funding. Conservation/preservation of French historical sites, e.g., Bourbonnais, Bordeaux and Beauvais, have already been considered in a $250,000 Columbia University-sponsored research project by the PI and McKee, a leading participant of this project. It is anticipated that the students and the faculty members will design appropriate conservation measures and effective tourism strategies in Cambodia based on the French experiences.

a-ii: In this proposal the **B**uild **B**right **U**niversity, the largest private university in Cambodia, is an active partner. Pattnaik, its International Education Coordinator, has already established teaching/research connections with top-rated technical universities in India. The principal investigator has helped *BBU* to link with Japanese universities in Tokyo, Osaka and Takamatsu. The team will benefit from the aforementioned international relationships.

a-iii: In an upcoming NSF proposal on Biodiversity the principal investigator is interacting with the most prominent state supported university in Cambodia (University of Phnom Penh) via the Columbia Schools of Engineering, Architecture, and the Earth Institute.

(b) Partnership:

b-i: NIH:

Dr. Das is a New York City health official who will establish the cooperation between her alma maters (Harvard and Columbia) and the health care professionals in Cambodia who deal with HIV issues. With the development of tourism the unfortunate devastating effects on girls and young women cannot escape the concerned policy makers. Dr. Das' experiences with sex workers will shed light on the sessions addressing health concerns.

In a future research proposal the team will seek funding from international agencies as required by many NIH initiatives.

b-ii: USAID:

The role of the US Embassy in Phnom Penh for the success of the proposed workshop is indeed commendable. They will participate in the workshop and will be invited for formal presentation. In addition, the team will seek funding from the US State Department for a multi-year, multi-disciplinary research proposal that will involve students (undergraduate, graduate and PhD).

b-iii: World Monuments Fund:

In December the principal investigator and McKee visited the Siem Reap office of the **W**orld **M**onuments **F**und. *WMF*'s field engineer, Kimreth, will participate in the workshop (funded by **B**uild **B**right **U**niversity).

WMF's Project Manager, Harvey will submit an ongoing progress report and will interact with the team to seek an international research grant for the historic site of Preah Khan, Angkor.

E- Business Cooperation:
A US investment bank is considering construction of a factory in Cambodia to mass produce solar kits for water treatment.

F- Dissemination of results:
The prior NSF/CNRS grant has funded the software necessary for quality publications. Here a modest amount has been requested for hardware/supplies

for economical widespread distribution of all conference materials that will be available from a Columbia University website.

G- Societal benefits:

Benefit to the society is the seed motivation for the workshop.

Engineering development must be applied to the socio-economic issues addressed in this workshop proposal.

Both Cambodia and the US will benefit culturally, technologically and economically with assistance from the US Embassy in Cambodia. All information of interest (text and graphics) will be placed on the web for unrestricted downloading.

The principal investigator has, based on the cooperative efforts of partners in the NSF/CNRS grant, begun a process of developing educational programs for museums under the leadership of Dr. Ian Tattersall, Curator, American Museum of Natural History (AMNH) in New York City. Additionally, the development of tourism at cultural heritage sites has long been of importance to the group (AMNH and Columbia U.) for their long-term strategies and plans for continuing the collaboration.

7 Conclusions

A diverse group of researchers and educators will address a wide range of theoretical and practical issues during a five-day workshop accented by a two-day field and laboratory visits. The budget reflects all costs only for the US participants.

Complementary expertise – U.S. and foreign partners:

Engineering Analysis is the common bond between Columbia University, **A**sian **I**nstitute of **T**echnology and ***I****nstitut de* ***T****echnologie du* ***C****ambodge*. Human and Environmental Ecology experts are from the US; Cambodian delegates bring the Tourism Development Experiences.

Meeting dates:

The tentative period of meetings is December 13 to 17, 2004 or January 5 to 12, 2005. The final dates will be announced by November 1, 2004 by emails and will be posted on a Columbia University website.

Publications:

The participants will be encouraged to include their workshop experiences in peer reviewed articles.

Access for disabled participants:

Proposed conference venues have access to attendees with disabilities. For historical reasons these arrangements are common throughout Cambodia.