LEARNING TECHNOLOGIES AND MATHEMATICS MIDDLE EAST CONFERENCE

SULTAN QABOOS UNIVERSITY, OMAN

MARCH 31-APRIL 2, 2007

http://math.arizona.edu/~atp-mena/conference/

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THE UNIVERSITY OF ARIZONA
INSTITUTE FOR MATHEMATICS AND EDUCATION

SULTAN QABOOS UNIVERSITY

Learning Technologies and Mathematics Middle East Conference
Sultan Qaboos University, Muscat, Oman
March 31–April 2, 2007

http://math.arizona.edu/∼atp-mena/conference/

March 25, 2007

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Contents

1 Honorary

H.E. Dr. Yahya Al-Mandhari, President of the State Council of the Sultanate of Oman, will attend an honorary session on the last day of the conference.

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2 Keynote

Explanations for the Causal Attribution of Students' Low Enrollment in Mathematics Majors: Empirical Anecdote from Lebanon

Kamal Abouchedid Email: kabouchedid@ndu.edu.lb
Director, Center for Applied Research in Education (CARE)
Notre Dame University, Lebanon

Abstract: The relatively low enrollment of students in mathematics majors in higher educational institutions in Lebanon tinged with existing traditionally demarcated 'feminine majors' as opposed to traditionally demarcated 'masculine majors' warrant systematic educational research into the variegated influences wielded on students' choice of majors. This study employed the attribution taxonomy of individualism, structuralism, uncertainty, and fatalism to examine the attributions of choice of scholastic majors, mathematics included, among a sample of Lebanese high school students ($n = 648$) applying to a private university in Lebanon. A VARIMAX principal component factor analysis generated four factor-dimensions with students' uncertainty about choosing their majors appearing as the first factor followed by individualism and hard work as the second. Additionally, the study examined the effects of gender, parents' education, and students' intended majors on their attributions. Analyses gave attention to fathers' influence exerted over their sons' and daughters' choice of majors. The results of the study should be helpful to educators, career counselors and education decision-makers interested in de-emphasizing dogma and de-gendering student choice of majors, particularly mathematics majors.

Short Bio: Dr. Abouchedid is director of the Office of Tests, Measurement and Evaluation at Notre Dame University, Lebanon. Dr. Abouchedid is a leading Lebanese expert on education theory and practice in the Arab world. He received his Ph.D. in Education from the University of Manchester, U.K. in 1997. Further, he was a visiting Fulbright scholar at the University of Florida, Gainesville, Florida where he had worked for 8 months at the Department of Sociology under the supervision of Professor Joe R. Feagin. Dr. Abouchedid has published his multi-disciplinary research papers in North American and Western European refereed, indexed and abstracted journals.

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The Role of Proving and Programming in Math Education

Bruno Buchberger Email: bruno.buchberger@risc.uni-linz.ac.at
Research Institute for Symbolic Computation (RISC)
Johannes Kepler University, Linz, Austria

Abstract: Mathematical exploration proceeds in cycles. In one cycle, a mathematical concept (like 'is sorted' or 'limit') is introduced by a definition or by axioms, then propositions (theorems, lemmata) about the concept are invented and have to be proved, then problems involving the concept are specified and, finally, methods (ideally, algorithms) have to be invented - and proved correct - for solving the problems. Hence, methodologically, proving and "programming" (formulating correct algorithms) are the corner stones of mathematics. Surprisingly, in only very few math curricula, proving and programming - and their interaction - are explicitly taught. We consider this a serious problem of current math education.

In the talk, we will report on our expertise on teaching proving and programming in the frame of various math curricula from undergraduates to PhD students. Our course on the practice of mathematical proving is intimately connected with our research on establishing automated reasoning (proving) methods that accompany the entire mathematical theory exploration process and with our work on designing and implementing the novel software system *Theorema*. We will give a couple of examples how *Theorema* can support teaching proving and programming and their interaction. The use of mathematical software systems in teaching, in particular the use of systems that even can support proving, needs a careful analysis of the stage in which mathematical algorithms (including reasoning algorithms) should be called. For this, we introduced the didactic "White Box/Black Box" principle which we will explain in detail in the talk. Our course on the practice of mathematical proving, supported by the *Theorema* system, will also be offered in the frame of our new 'International School of Informatics Hagenberg' for bachelor and master students.

Short Bio: Bruno Buchberger is professor of Computer Mathematics at the Research Institute for Symbolic Computation (RISC), Johannes Kepler University, Linz, Austria. Prof. Buchberger is a Member of the European Academy of Science. with three honorary doctorates. He is founding editor of the Journal of Symbolic Computation. He is founder of the Research Institute for Symbolic Computation (RISC), the Software Park Hagenberg, Austria, and the International School for Informatics, Hagenberg, Austria. Prof. Buchberger is the inventor of the theory and method of Gröbner bases:

- over 3000 citations in the on-line citation index citeseer.nj.nec.com,
- several millions of installations in the current mathematical software systems like Mathematica, Maple etc.,
- worldwide, ten textbooks were written on Buchberger's Gröbner bases theory,
- and worldwide over 1000 research papers were published on his theory.

His current main research activity is to initiate and direct the *Theorema Project* for formal mathematics (automated mathematical proving and formal theory exploration). He presented 150 keynote and invited talks at international conferences in Europe, US, Asia, Australia.

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The Teaching of Mathematics: What Changes Are on the Horizon?

Deborah Hughes Hallett Email: dhh@math.arizona.edu
University of Arizona/Harvard University, USA

Abstract: The past two decades have seen significant changes in the teaching of undergraduate mathematics. In this talk, we will look at why this has happened and what the changes are. We will consider the impact of changes in curriculum, pedagogy, and technology on our courses. What changes do we expect in the future? How do we make our courses good preparation for further mathematics, for engineering, and for the quantitative natural and social sciences? What role can technology play and what challenges does it bring?

Short Bio: Deborah Hughes Hallett is Professor of Mathematics at the University of Arizona and Adjunct Professor of Public Policy at the Kennedy School of Government, Harvard University. Professor Hughes Hallett is an international authority on the teaching of mathematics. She is the author of several college-level mathematics texts and is a member of the College Boards Committee reviewing the new Math-SAT. Professor Hughes Hallett has recently completed a National Academy of Science report on Advanced Study in American High Schools. She has received the MAA's Louise Hay Prize, and was elected Fellow of the American Association for the Advancement of Science, for her contributions to mathematics education. In 2004, she received the MAA Award for Distinguished Teaching. In 2005, Professor Hughes Hallett won the University of Arizona's College of Science "Award for Innovation" in recognition of her "outstanding educational innovation developed and applied in the classroom."

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Growth of Sultan Qaboos University - With Special Reference to Mathematics and Statistics

Edamana V. Krishnan Email: krish@squ.edu.om
Sultan Qaboos University
Muscat, Oman

Abstract: The talk will focus on the ever changing face of Sultan Qaboos University (SQU) - the premier national institution of the Sultanate of Oman. It will consist mainly of two parts. The first part will be devoted to the general academic environment at SQU. In the second part, I propose to cover all possible aspects of academic activities in the Department of Mathematics and Statistics (DOMAS) including a brief history of the Department and its future plans. I shall conclude my talk by discussing DOMAS' plans to introduce technology in teaching.

Short Bio: Professor E.V. Krishnan received his Ph.D. degree in Mathematics from Indian Institute of Science, Bangalore, in 1979. He is currently working as an Associate Professor in Applied Mathematics in the Department of Mathematics and Statistics at Sultan Qaboos University. He has been associated with Sultan Qaboos University since November 1987, and has been both participant and observer to the events and developments that have greatly transformed the shape of this institute since its inception. Also, he has been the Deputy Head of the Department since September, 2004.

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How does technology change what we teach? A case study

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University Distinguished Professor of Mathematics
Director, Institute for Mathematics and Education, *http://ime.math.arizona.edu*
Department of Mathematics
University of Arizona, USA

Abstract: Technology affects both how we teach and what we teach. It affects how we teach by providing new tools for presenting mathematical ideas, for example by displaying complex visual information. In this talk I would like to focus more on how it affects what we teach. When technology is available to carry out complex computations, we are faced with both problems and opportunities. I will consider these using the particular case of symbolic manipulation technology in calculus.

Short Bio: William G. McCallum is a University Distinguished Professor of Mathematics at the University of Arizona. Born in Sydney, Australia in 1956, he graduated with honors and a University Medal from the University of New South Wales in 1977, and received his Ph.D. in Mathematics from Harvard University in 1984, under the supervision of Barry Mazur. After spending two years at the University of California, Berkeley, and one at the Mathematical Sciences Research Institute in Berkeley, he joined the faculty at the University of Arizona in 1987. In 1989 he joined the Harvard calculus consortium, and he is the lead author of the consortium's multivariable calculus and college algebra texts. In 1993-94 he spent a year at the Institut des Hautes Etudes Scientifiques, and in 1995-96 he spent a year at the Institute for Advanced Study on a Centennial Fellowship from the American Mathematical Society. In 2005 he received the Director's Award for Distinguished Teaching Scholars from the National Science Foundation. His professional interests include arithmetic algebraic geometry and mathematics education. He has received grants and written articles, essays, and books in both areas. He is currently director of the *Institute for Mathematics and Education* at the University of Arizona.

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What shall we teach in Statistics and Probability, from a distance?

Walter W. Piegorsch, University of Arizona, USA Email: piegorsch@math.arizona.edu

Abstract: Instruction in statistics and probability has grown dramatically over the past 50 years. This is recorded in traditional sources such as large research universities and small baccalaureate colleges, and also from industry and government sources that require continuing education of their workforce in quantitative literacy and data-oriented thinking. Concurrent innovations in computer/internet/communication technologies have enhanced how such instruction can be offered: web-based courses in statistics and software to accommodate online/distance education in this area are active, growing endeavors. Seen most commonly is traditional instruction in introductory statistics and probability, but more advanced courses are also appearing at both the undergraduate and graduate levels. We discuss whether this evolving paradigm for online/distance instruction in introductory statistics extends naturally to more advanced material, and whether there exists a cadre of statistics and probability courses that may be difficult, even impossible, to teach effectively from a distance.

Show Bio: Professor Piegorsch earned an M.S. and a Ph.D. Statistics at the Biometrics Unit, Cornell University. He was a Statistician with the U.S. National Institute of Environmental Health Sciences from 1984 to 1993, then moved to the University of South Carolina, Columbia, where he was Professor and Director of Undergraduate Studies in Statistics. In August 2006, Walter moved to University of Arizona where is currently a joint professor at the College of Public Health and at the Department of Mathematics, and a member of the BIO5 Institute.

Professor Piegorsch has co-authored or co-edited two books, Statistics for Environmental Biology and Toxicology with A. John Bailer, and Case Studies in Environmental Statistics with Douglas W. Nychka and Lawrence H. Cox. He also serves or has served as a member of the Editorial Board of Environmental and Molecular Mutagenesis and Mutation Research, the Editorial Review Board of Environmental Health Perspectives, and as an Associate Editor for Environmetrics, Environmental and Ecological Statistics, Biometrics, and the Journal of the American Statistical Association. Walter is a Fellow of the American Statistical Association, an elected member of the International Statistical Institute, and has received a Distinguished Achievement Medal from the American Statistical Association Section on Statistics and the Environment. He has served as Vice-Chair of the American Statistical Association Council of Sections Governing Board, as Program Chairman of the Joint Statistical Meetings, and as Secretary of the Eastern North American Region of the International Biometric Society. He has also served and continues to serve on advisory boards and peer review groups for governmental agencies including the U.S. National Toxicology Program, the U.S. Environmental Protection Agency, and the U.S. National Science Foundation.

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Adventures in Teaching with Technology

Webster West
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Abstract: There are a tremendous number of technology resources available for teaching statistics. These range from interactive web-based applets to video lectures. The trick is often times determining which resources actually work and how best to incorporate them into your courses. Techniques for evaluating technology learning tools and some common integration approaches will be discussed. A discussion of the potential impact of technology on the future of statistics education will also be provided.

Short Bio: Webster West is an associate professor of statistics, Dept. of Statistics, Texas A&M University. He is also the founder and CEO of *Integrated Analytics LLC*. Professor West has published extensively in computational and graphical statistics and is considered one of the pioneers in learning via the World Wide Web. In fact, Professor West is the developer (with Todd Ogden of Columbia University) of DoStat, an online course management system. He also created WebStat and StatCrunch, which are data analysis softwares for the Web. Professor West has written many applets to help statistics students learn interactively.

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INSTITUTE FOR MATHEMATICS AND EDUCATION

Newly established with support from the University of Arizona, the College of Science, the College of Education, and the Udall Center for Public Policy, the Institute for Mathematics and Education aims to provide a home for disciplined collaborative work among different professional communities with a stake in mathematics education.

MATHEMATICS SCIENCE THE UNIVERSITY OF ARIZONA.

MAKING CONNECTIONS: The Making Connections project is funded by a 4-year, $300K National Science Foundation Distinguished Teaching Scholar award.

William McCallum, Principle Investigator, aims to establish a model for collaboration between mathematicians, educators, and teachers, centered around analysis of student work on algebra problems.

UNTANGLING KnoTTS (Knowledge for teaching secondary school): Modeled on the MSRI Elementary Mathematics Project, this initiative of co-director **Rebecca McGraw** investigates the nature and processes of collaborative work between mathematicians and educators on identifying the mathematical knowledge necessary for teaching secondary school mathematics and how it develops.

ARIZONA TEACHER INITIATIVE: A Math Science Partnership for middle and high school teachers, and math postdocs. **Dan Madden** is Principle Investigator.

- **Master's Degree in Middle School Mathematics Leadership**
  A three-year part-time degree for middle school mathematics teachers with elementary certification.
- **Certificate in Mathematics Teacher Mentoring**
  A one-year, full-time residential program, with a prerequisite of secondary certification or equivalent
- **Postdoctoral Fellowship in Teacher Preparation**
  A three-year fellowship, modeled on the department's Teaching Postdoctoral Fellowship, for recent mathematics Ph.D.s.

Located on the University of Arizona campus in the heart of the Sonoran Desert, the Institute welcomes scholars, administrators, and policy experts for visits to undertake collaborative work. To apply, send a curriculum vitae and a description of the proposed work by email or mail to:

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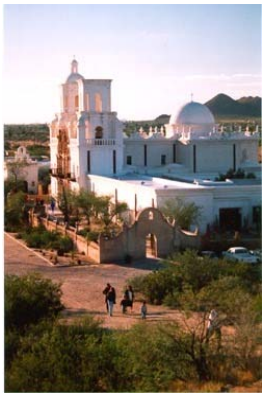

3 Workshops

WeBWorK

Michael Gage, Email: gage@math.rochester.edu
University of Rochester, USA

Introduction to the WeBWorK online homework system

Abstract: This hands-on workshop will give the participants a feel for the capabilities of WeBWorK and allow them to determine how the WeBWorK online homework might be used in the courses they teach.

After a brief overview of WeBWorK's capabilities we'll guide participants through the process of constructing problem sets from the extensive library of existing homework problems, assigning problem set due dates and other aspects of using WeBWorK in classes. We'll also give a brief introduction to how existing WeBWorK homework problems can be customized and how new homework problems are authored.

We'll introduce the workshop participants to the mathematics community actively using and developing WeBWorK. Finally we'll provide links to the resources and people available through the web from which they can obtain further information and help while they are using WeBWorK at their own institutions.

WeBWorK is an open source project and is freely available to all academic institutions. Further information can be found at http://www.maa.org/webwork/ and at http://webwork.rochester.edu.

Short Bio: Michael Gage received his B.S. from Antioch College and his Ph.D. in mathematics from Stanford University in 1978. His thesis in differential geometry was supervised by Robert Osserman. He has held visiting positions at Michigan State University, the University of Delaware, the University of Pennsylvania, Case Western Reserve University, l'Institut des Hautes Etudes Scientifiques (Paris) and the University of California at San Diego. He is currently a full professor at the University of Rochester.

Professor Gage has worked on a range of problems in differential geometry, including isoperimetric problems such as a proof of Gehring's conjecture on linked spheres and eigenvalue estimates on Riemannian manifolds. Professor Gage was the recipient of the MAA Seaway section Distinguished Teaching Award for 1996-97 and also received the University of Rochester's prestigious Goergen Award for Distinguished Achievement and Artistry in Undergraduate Teaching in October 1997.

Beginning in 1996, Prof. Gage and Prof. Arnold Pizer began the development at University of Rochester of a web-based system for checking homework and providing immediate feedback for students using the World Wide Web. Called WeBWorK, and supported by a grant from NSF, the system is now in use at over 100 universities and colleges. Prof. Gage has been active in promoting co-curricular mathematics activities for undergraduates. He was the faculty advisor for SUMS (Society for Undergraduate Mathematics Students) from its inception until 2001. He also serves as the department's liaison to the MAA (Mathematics Association of America).

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Business Mathematics: The Arizona Model of Integrating Technology into Learning

Lotfi Hermi, University of Arizona Email: hermi@math.arizona.edu

Abstract: In 1998, The University of Arizona redesigned the two-semester mathematics sequence taken by business students. The resulting electronic course is called Mathematics for Business Decisions (MBD). This e-course came into existence thanks to collaboration between the Mathematics Department and the Eller School of Management. Its electronic text won its authors the ICTCM Award for Excellence and Innovation. The e-text has been published by the Mathematical Association of America as a model for interdisciplinary collaboration between departments, and has been translated into Spanish for use in Mexico. MBD reflects the needs of most undergraduate and graduate business and management programs in the United States. About 1200 University of Arizona students take MBD per semester. MBD is a radical departure from traditional practice as it:

- introduces the mathematics in the context of realistic business problems;
- makes heavy use of spreadsheets and the Internet as the course is entirely computer-based;
- emphasizes communication skills–students, working collaboratively in teams, present their solutions to the rest of the class.

Students use mathematics and computer tools to prepare oral and written reports on realistic business projects, currently Loan Work Outs, Stock Option Pricing, Managing ATM Queues, Marketing Computer Drives, and Bidding on Oil Leases.

In this hands-on workshop, participants will have a guided tour of MBD and will take part in an actual demonstration of a classroom session. Participants will work on the Loan Work Out project, in teams. Each team will be given the conditions of a borrower who is defaulting on a loan and the records used to profile previous borrowers. These records and the tools of probability will then be used to decide whether to foreclose or work out the loan for the team's specific borrower.

Participants will receive CDs describing MBD in detail and containing the necessary data from which they are to do the simulation. The workshop will be conducted in the computer lab. In the presentation, the novel use of D2L as a teaching aid in this course will also be illustrated. To learn more about the course, go to the Mathematics for Business Decisions website *http://business.math.arizona.edu/MBD/mbd.html*

Short Bio: Lotfi Hermi received his PhD in Mathematics from the University of Missouri, Columbia in 1999. He has been at the University of Arizona since 2000. Dr. Hermi lead the Mathematics for Business Decisions workshop at the Third International Conference on the Teaching of Mathematics at the Undergraduate Level in Istanbul, Turkey (July 2006), and has used technology in the classroom since 1993 (Mathematica, Excel, WinPlot). Together with Professors Hughes Hallett and McCallum, he developed materials for exploring apportionment procedures around the world. Dr. Hermi's research has focused on bounds for eigenvalues of elliptic operators with applications to physical and geometric problems.

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DoStat

Obaid Al Saidy
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Introduction to DoStat

Abstract: DoStat is a course management system and data analysis software bundled together in a seamless environment. The main goal of the system is to offer everything needed for an online course in statistics or any other field where data analysis plays a significant role. In this hands-on workshop, participants will be introduced to the various features of DoStat. Particularly, participants will learn how to add courses to DoStat and how students can register for a course on DoStat. Participants will also learn how to add, edit, grade assignments using DoStat. Finally, we will explore the accompanying data analysis software, Webstat, and learn how to deal with data sets. For more information on DoStat, logon to http://dl.stat.tamu.edu/dostat/ .

Short Bio: Obaid Al-Saidy received his Ph.D. in Statistics from University of South Carolina in 2001. Dr. Al-Saidy is currently assistant professor at the Department of Mathematics and Statistics, Sultan Qaboos University. His research interests include Environmental Statistics, generalized linear models, and ranked set sampling.

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Programming in Mathematica

Nabil Fares, Balamand University/Wolfram Research Email: nffares@mac.com

Abstract: This course aims to present *Mathematica*'s programming features in depth in a one-day course that enables attendees to develop their own programs to extend *Mathematica*'s capabilities. This course emphasizes program structure as well as functional and rule-based programming, which is compared to more traditional procedural programming, to help attendees understand and use *Mathematica*'s unique features to their advantage. In the course attendees learn how to solve particular problems more efficiently by choosing the appropriate programming paradigm. The course includes practical hands-on exercises to help attendees understand the material and to provide a focused and practical learning experience.

Short Bio: Professor Nabil Fares, has taught a variety of engineering courses at several universities. Before starting his own consulting company, he was a professor at Rensselaer Polytechnic Institute in Troy, New York, and then at Polytechnic University in Brooklyn, New York, for a combined period of about 10 years. As a certified instructor for Wolfram Research, Fares has taught *"M101: A First Course in Mathematica"* since 2001. Fares has used *Mathematica* since 1988 in both teaching and research. In teaching, he has developed and demonstrated *Mathematica* packages to illustrate engineering analysis methods. In research, he has developed advanced engineering software for clients, an experience that has enhanced his teaching abilities.

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Mathematica for Beginners

Medhat A. Rakha
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Abstract: The workshop is designed primarily for people who are interested in becoming expert *Mathematica* users but who currently have little or no experience with the system. This workshop can also be helpful for experienced users who would like to broaden their basic understanding of *Mathematica* and for those interested in learning exactly what the system can do. The main topic of the workshop will be:

Introduction: Step-by-step instruction on performing basic operations, building up computations, and navigating the user interface as well as a description of sources for additional information and a tour of the features of the system.

Notebooks and Typesetting: Introduction to the notebook interface, cells and cell styles, style sheets, typesetting, and formatting features.

Mathematics: Tour of the mathematical features of the system with a focus on symbolic and numerical calculations : Solving equations, Working with Matrices, A brief introduction to Calculus

Graphics: Two- and three-dimensional plotting, plotting data, using options, labeling plots, and manipulating graphical expressions

Short Bio: Medhat Rakha started his academic career in 1993 as a Lecturer in the Department of Mathematics, Suez Canal University, Ismailia, Egypt. In 1998, He obtained his Ph.D. in Algebra and Special Functions from both Suez Canal University, Ismailia - Egypt and Texas A&M University - USA, and was promoted Assistant Professor. Rakha has been teaching courses in a wide range of topics in pure and applied mathematics. He has started teaching *Mathematica* in 1999. He organized the first *Mathematica* workshop in the Middle East, entitled *"Mathematica in Education & Research"* in Ismailia, Egypt 2001. Rakha is a certified instructor of *Mathematica*. Medhat Rakha is now on leave at the Department of Mathematics and Statistics, College of Science, Sultan Qaboos University, Muscat - Oman. In 2004, Medhat Rakha, with the support of UNESCO and Wolfram Research Europe, co-organized the *"Mathematica Gulf Conference 2004"* at Sultan Qaboos University, the Sultanate of Oman.

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4 Contributed Talks

Using GSP in Discovering a New Theory

Name: Mofeed Abumosa
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Department of Education
Arab Open University
Amman, Jordan

Abstract: The paper discusses the use of GSP and deals with ideas of using such software in teaching geometry both in schools and in teacher pre-service programs. The paper also tries to connect between the Van Heil thinking levels and the GSP software.

Short Bio: Mofeed Abumosa has been working at the Arab Open University for 18 years as a teacher and supervisor of mathematics. He worked for 3 years with Rubicon and the Cisco Learning Institute in preparing E-Curriculum for the Kingdom of Jordan.

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Teaching BVP's with Technology: a Sample Class

Name: Ghada Alobaidi Email: galobaidi@aus.edu
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American University of Sharjah
Sharjah, United Arab Emirates

Abstract: In teaching a course on differential equations, we make extensive use of a computer algebra package, Maple. In our course, students continue to learn, and employ, the classical solution techniques for differential equations, but are encouraged to use computer algebra for routine tasks, such as integration and differentiation and keeping track of coefficients, so that ours is essentially a traditional course but with the students getting a little help with the bookkeeping. The rationale for this approach is that we feel that knowledge of the solution techniques is requisite for students to understand the solutions, and using Maple for the bookkeeping allows the students to spend more time focusing on the big picture. Joint work with Roland Mallier.

Short Bio: Ghada Alobaidi is Assistant Professor of Mathematics at American University of Sharjah, Department of Mathematics and Statistics, Sharjah, United Arab Emirates (UAE). She received her PhD in 2000 from University of Western Ontario, Canada. Her research interests include partial differential equations, mathematical finance, integral transforms and special functions.

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The "Mathematics and Science Teacher Education Reform in Yemen" (MASTERY) Project

Wadia Al-Shameri Email: wfha61@yahoo.com
Vice Dean of Student Affairs
Faculty of Applied Science
Thamar University
Thamar, Yemen

Abstract: The MASTERY Project seeks to assist Yemen to improve the quality, relevance and effectiveness of the education and training of science and mathematics teachers. MASTERY is a mathematics consortium formed by a team of mathematics and science teachers at the Universities of Thamar (TU), Sana'a (SU) and Al-Hodeidah (HU). Thus far MASTERY has produced the following documents:

1. Curriculum analysis
2. Content standards
3. Teacher standards
4. ICT standards

for the new teacher education programmes at the three universities. MASTERY's main focus for the Jan. 2007–Dec. 2007 period has been on:

1. The development of the new teacher education (TE) programmes at the three universities SU, HU and TU.
2. Implementation and evaluation of the pilot projects defined and elaborated in 2006.
3. Development of new courses (outlines and materials development) in the new programmes
4. Implementation of the new programmes at SU, HU and TU
5. Training for implementation (especially for those coordinating ICT, practical work etc).

I will present my work as a Curriculum Reform Leader (CRL) of the Faculty of Applied Science, Thamar University, and one of the editors of the Content and ICT standards. More information about MASTERY can be found at http://www.hepyemen.org/en/mastery.php

Short Bio: Dr. Wadia Al-Shameri was chairman of the Department of Mathematics at the Faculty of Applied Science, from Dec 2003 - Jan 2007 and is now a Vice-Dean of Student Affairs at the Faculty of Applied Science, Thamar University. Dr. Al-Shameri holds a PhD in Mathematics from Al-Mustansiriyah University and was a scholar in residence with the Educational Research and Development Center (ERDC), Sana'a, Yemen, 1986-2002.

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A Mathematics Crash Course: "Is the Math Path Right for You?"

Rajaa Al Talli Email: rtalli@scs-net.org
Department of Mathematics
Damascus University
Damascus, Syria

Abstract: This paper presents an introductory course for freshmen specializing in university-level mathematics. The purpose of this course is to identify future mathematicians, and illustrate to them how their skills can be beneficial both for themselves and for society. While contemporary university Mathematics provides students with many technical skills, it does not give them the broad picture of the discipline. Thus, students often have difficulties connecting their studies to their future lives. In addition, there are many students who regret entering the discipline of Mathematics after graduation. This course remedies this problem by providing students a broad overview of their future studies and possible career applications. It also helps students decide from the beginning whether Mathematics is the right path for them.

Short Bio:

Professional experiences:

- 2000-2006: Tutoring secondary and high school students math (25 h per week);
- 2004: co-teaching "Invention and Development Science" at Al Baath University, Homs, Syria (3 months), guiding students in project work and correcting assignments;
- 2001: Lecture on"Operation Research" at Aleppo University, Syria (2h);

Education:

- 2005-2006: working on two research projects: "structural calculus" and "density in graph theory";
- 2003: Diploma in Informatics, Mathematics; ranked first student in the Math Department at Damascus University;
- 2002: Bachelor degree in Informatics, Mathematics; ranked first student in the Math department at Damascus University;
- 1997: Scientific Baccalaureate, Damascus, Syria

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Fast Fourier Transformation of Vibration Signals using Microsoft Excel

Name: Mohammed Aref Email: mdaref120@gmail.com
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Abstract: One needs to do signal analysis for a variety of situations. The Fast Fourier Transformation (FFT) is the mainstay of vibration signal analysis as it is the most time saving algorithm. It is an algorithm which computes the Fourier Transformation of discrete data. This can be done using several of the packages available. We chose to use Microsoft Excel as it is very widely available. Microsoft Excel is a wonderful and easily available application which can be used for implementing this algorithm. The experiments show that this method is capable of finding the Fourier Transformation of vibration signals. Results obtained using Excel are compared with Matlab and are found to be in excellent agreement.

Short Bio: Mohammed Aref is Senior Lecturer at the Salalah College of Technology, Salalah, Sultanate of Oman. He has a Masters in Computer Science and is doing Ph.D at Dr. Baba Saheb Ambedkar Marathwada University, Aurangabad, Maharashtra, India. He has an experience of six years of teaching and two years of programming in the corporate world.

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Can GAP4 be Used in (Under- or) Graduate Teaching of Algebra?

Name: Thomas Bier Email: tbier@squ.edu.om
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Muscat, Oman

Abstract: The Software *GAP4* is a very powerful device for doing algebraic manipulations, in the area of groups, rings, fields and in several other parts of algebra. Unfortunately it is notorious for not being user-friendly and also for other difficulties, e.g. for operating in a DOS based environment.

In this talk we want to analyze some examples on how *GAP4* has been used in Algebra/Group Theory courses at the late undergraduate and early graduate level. A comparison with the group package of Maple will also be attempted.

Short Bio: I am presently Assistant Professor of Mathematics at Sultan Qaboos University in the Department of Math. Previously, I taught in Kuala Lumpur at the University of Malaya and in Singapore at the National University.

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Quantitative Skills Assessment at a Liberal Arts College, AUI as an Example

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Abstract: We propose to assess by an exhaustive study the quantitative skills of AUI, as an example of a Liberal Arts College, a model that is novel in the Moroccan education scenery and outside the American educational system in general. We propose to point out the strengths and weaknesses of our students in terms of mathematical skills, and to suggest ways that would help consolidate the existing strengths and also to overcome the possible deficits.

Short Bio: Fouad Chaatit is an Associate Professor of Mathematics at AUI and Full Professor at Mohammed V University in Rabat. He graduated with a Bachelor in Mathematics in 1981 from Université de Haute Normandie in Rouen, France. He earned his Master's from the same university in 1982. He then moved to Paris where he studied Stochastic Processes and Analysis in Université Pierre et Marie Curie, Paris 6 to earn a Diplome d'Etudes Approfondies in September 1983. He then started a doctoral degree and studied Analysis and Probability in several Parisian institutions including IHP, ENS, IHES, Orsay to earn a Doctorate in October 1985 from Université Paris VII, after which he moved back to Morocco to teach at Mohammed V University in Rabat. In 1988, he moved to the US where he earned a Ph.D. in Mathematics (Analysis) from the University of Texas at Austin in 1993. He worked as a Visiting Professor in the University of Texas at El Paso from 1993 to 1994, then as a Visiting Professor at the University of Missouri–Columbia from 1994 to 1995, when he joined AlAkhawayn University. Professor Chaatit has been an Associate member of the Indian Statistical Institute, of the TWAS, was a Fulbright Scholar and an Invited Speaker at several AMS conferences as well as a NATO Advanced Studies Institute. He has authored several fundamental mathematics articles.

Dr. Abdelkrim Marzouk received his Ph.D from Clark University in 2005 and joined Al Akhawayn University as Assistant Professor in 2005. His interests include geographic information systems, remote sensing, and cartography. He has been active in different field projects and has a wide experience in data collection, sampling, coding, and statistical analysis. He participated in international workshops on building capacity for public opinion research in North Africa and the Middle East, department of political science, University of Michigan. He also participated in a workshop on "Research methods in social sciences"organized by the Middle East Research Competition (MERC) in Cairo. His field of expertise: GIS Remote sensing and statistics.

Dr. Véronique Van Lierde is Assistant Professor of Mathematics at Al Akhawayn University, Ifrane. She received her Ph.D. in Mathematics, 2004, from Katholieke Universiteit Leuven, Belgium.

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On Endeavoring to Find a Relationless Relationship Between Mathematics and Civil Society Within the Framework of Universal Design for Learning: A Student-Centered Approach

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Abstract: The world of teaching and learning the art and science of numbers, quantities and measurements is shimmering in the dawn of a new paradigm called Universal Design for Learning (UDL), which if used properly can diminish the differences between individual learners. From a rugged stage of collective action around shared interests, purposes and values, the term "Civil Society" has grown and matured into a grandeur beyond comparison and became the backbone of many democratic setups by facilitating an understanding of interconnectedness of society and interests within it. This paper initially introduce the reader to the concepts of student centered approach and UDL, teaching mathematics using UDL in a student centered environment, and the role that can be played by civil society in teaching mathematics. This paper explores the possibility of finding a relationless relationship between Mathematics and Civil Society. It concludes with a strategy for using Civil Societies in creating an awareness of mathematics in the daily life of a common man and also to combat the problem of declining numbers of students pursuing mathematics as a specialization especially in educationally developing countries.

Short Bio: Dr. C. Rama Chandra Prabhu is Faculty Member of Physics from the Department of Applied Sciences, Higher College of Technology, Ministry of Manpower, Sultanate of Oman. He received his Ph.D. from Acharya Nagarjuna University in Physics. He has been teaching Physics for the past 16 years for various courses at the research, post-graduate, graduate and undergraduate levels in university and affiliated colleges in India and Oman. His research interests include liquid crystals as well as socio-scientific issues. In his 15 years of research career, he had presented many papers at both international and national conferences in India and the US. He participated in more than 25 workshops, seminars and training programs in a wide range of subjects: Condensed Matter Physics, Information and Educational Technologies, and Instruction Design. As a student he had won the prestigious *Nehru Memorial Best Outgoing Student Award* at the Graduate level besides winning more than 100 prizes for co-curricular and extra-curricular activities. He had served as a member for editorial boards of many newsletters and proceedings of national conferences.

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Innovative Methods of Teaching

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Abstract: The purpose of this paper is to evaluate the traditional methods of teaching as well as multimedia teaching and to suggest some other useful teaching methods that can be tried in imparting knowledge to the students. Basically, teaching must include major two components like sending and receiving message. Ultimately a teacher tries his best to impart knowledge as the way he understood the message. So, any communication method that serves this purpose without destroying the objective could be considered as innovative method in teaching. The use of innovative methods in educational institutions has the potential not only to improve education, but also to empower people, strengthen governance, open up new markets and galvanize the effort to achieve the human development goal for the country. Teaching methods–say traditional or innovative– are examined and evaluated and some of modifications in the delivery of knowledge is suggested. As such, the strengths and weaknesses of each teaching methodology are identified and probable modifications that can be included in traditional methods are suggested.

Dr. V. S. Damodharan has 10 years of experience in teaching experience in India and in Oman. He is a Member of Associated Chartered Certified Accountants of U.K., Member of Institute of Chartered Accountant of India and Asssociate Member of The Institute of Cost and Works Accountants of India. Currently, he has been working as Senior Lecturer in Higher College of Technology, Oman. His Ph.D. research was on "Entrepreneurial Development".

V. Rengarajan is an Associate Member of the Institute of Cost and Works Accountants of India and has ten years of experience in teaching finance and accounting courses both in India and Oman. Currently, he has been working as Senior Lecturer in Higher College of Technology, Oman.

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The Difficulties Facing Technology Integration in Math Education in Lebanon

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Abstract: The 21st century is offering remarkable advances on information technology that have a significant impact on math education. However, the integration of IT in math teaching and learning in Lebanon is not as easy as it may seem. The purpose of this paper is to discuss the difficulties facing the integration of technology in math education in Lebanon especially those that are related to Lebanese math curriculum objectives and Lebanese math teachers' qualifications and offer suggestions to help overcome these difficulties.

Short Bio: Head of Math Department at Eastwood College (Kafrashima). SMEC Conference Committee Member (Science and Math Education Center, American University of Beirut). Evaluation of Math Lebanese Program Committee Member (Educational Center for Research and Development), B.S. Pure Mathematics, M.A. Math Education. Have presented several workshops about integration of technology in math teaching at SMEC and ICTME conferences held in Lebanon.

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A Computational Approach for Mathematics Teachers' Training Programs

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Abstract: Despite the fact that mathematics and computer science are strongly intertwined and each helps a better understanding of the other, the majority of the education programs for primary and intermediate school teachers, in the Gulf region, concentrate on mathematics with a limited knowledge in computer sciences. This paper explores the possibilities of teaching these two subjects in a uniform fashion. It presents a program for math and computer teaching in order to promote the learning of mathematics. This will make it possible for such graduate teachers to guide their pupils in mathematics classes to better understanding of computer sciences and to be able to use the related software and applications. Such program is expected to fill the gap in the teaching of students in the early stage of their life. Furthermore, as a result of the computer revolution most of the university students are interested in computers and the proposed program is expected to attract more students to study mathematics. During the discussion, the full suggested program will be displayed together with the perfectibility study for introducing such program.

Short Bio: Professor Fahady obtained his PhD degree in "Informatics and Operations Research" from the University of Hull in UK, MSc degree in OR from Manchester University, Diploma in System Analysis from Cairo University, BSc in Mathematics from Mosul University, and many training programs in computer sciences from institutes in UK, Egypt, and Iraq. During the last 33 years of his carrier as instructor, dean of administration college, director for scientific affairs, assistant to the president, and president of university of Mosul, he followed up designing and delivering academic programs for both under graduate and post graduate levels, and spent a good time in studying the financial feasibility of the newly introduced academic programs. As an Operations Researcher, he has very wide range of scientific interests, and during his carrier gathered a good experience in many fields, especially in Computer Sciences, Management, and Econometrics. Moreover, he was following up the research work of the academic staff, maintaining academic programs in all levels of study, and organizing training programs for staff members and others. He published four books in: System Analysis, Decision Theory, Probability Theory, and Research Methodology, supervised 35 postgraduate students, 19 of them for the PhD, and published 42 scientific papers in Mathematics, Statistics, computer sciences, and econometrics. For the last three years, his main field of interest was numerical analysis and computer sciences.

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Study on Appropriateness of Interactive Mathematics Software

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Abstract: The use of a computer based teaching program was investigated with college level and mature second language (Arabic mother tongue) numeracy-mathematics learners within a PC tablet-wireless environment. This paper reports the findings from a study evaluating the effectiveness of this medium in enhancing learning for sixty students distributed across three classroom sections. Pre and post questionnaires, student satisfaction surveys, and the analysis of problems related to technology adoption are discussed. There is no analysis of learning achieved by the participants because (as will be explained in the paper) of the connectivity problems as well as the language issues with the L2 students. Rather the research will surprisingly reveal increased motivational levels despite the disappointment incurred with software and opportunities to provide an altered approach to using technology in teaching.

Short Bio: Nancy Fahnestock is in the second year of the EdD program at Exeter University, studying TESOL and teaching math in English to L2 students. She has been teaching math since 1991 at the high school and college level and currently teaches for Higher Colleges of Technology in Al Ain in the Emirates.

Interdisciplinary Programs Involving Mathematics

Name: Mary George Email: marygeo@rediffmail.com
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Abstract: Mathematics plays a very important role in the modern world. Years ago, we believed that mathematics is a classroom discipline. Now we realize mathematics is a tool, rather than a discipline. This argument comes because mathematics is now the main ingredient of any finished good in pure or applied sciences. Modern technologies in medicine, the recent developments in communication, and the fast growing of engineering, are owed to mathematics to a great extent. Thus mathematical tools have allowed many advances in the present time. But, even now, most of the mathematics classrooms are boring. Students either hate mathematics, or fear it. The blame for this plight is partly to the teachers and the rest to the curriculum. Students get no interest in studying this subject, because neither the teacher nor the syllabus points out the practical use of the prescribed portions. Here comes the need of coining mathematics with other disciplines. There should be an interdisciplinary approach in teaching mathematics. In this paper, the authors wish to discuss some areas where mathematics can be used fruitfully and interestingly, so that students may enjoy the study of mathematics. Certain interdisciplinary programs are mentioned and discussed. Special emphasis is given to the areas of economics, where mathematics makes magic! The paper is based on a study made in certain schools in our locality; and also among experts of Mathematics Curriculum. Joint work with Dr. P. G. Thomaskutty, Mar Ivanios College, Trivandrum, India.

Short Bio:

First Author: M.Sc, M.Phil, B.Ed, Ph.D. Teaching Mathematics and Mathematical Economics for UG and PG students. Involved in Curriculum reformation for plus 2, UG and PG students. presently post-docoral fellow of University Grants Commission of India. authored books in mathematical economics.

Second Author: M.A, M.Phil, Ph.D. Teaching Economics for UG and PG students. Approved guide for Research. Supervisor of two Major Projects of University Grants Commission of India. Involved in Curriculum reformation for plus 2, UG and PG students. Author of books in Economics for plus 2 students.

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Computer Algebra Systems in General Relativity

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Abstract: General Relativity (GR) is Einstein's theory of gravitation in which spacetime is a 4-dimensional Riemannian manifold. The space-time geometry is determined by the distribution of the gravitational energy, and the motion of celestial bodies is determined by the spacetime geometry. The interaction between the spacetime and the gravitational energy is described by field equations and equations of motion in tensors form. Hence, the study of GR involves a large number of problems requiring very tedious, time-consuming, and error-prone algebraic manipulation. For this reason, GR was one of the earliest fields of application of Computer Algebra Systems (CAS). Besides using general-purpose systems, many specialized systems and packages have been developed.

This paper presents a review of the use of CAS in GR research and teaching. On one hand, the impact of using CAS in GR research is illustrated by pointing out some important achievements in the field. In particular, by using CAS, the author has been able to obtain results that would have been almost impossible otherwise. On the other hand, CAS can be a very helpful tool in teaching and learning GR. Some projects for using CAS in teaching GR are described.

Short Bio: Salah Haggag received his Ph.D. in Applied Mathematics in 1982 from the University of Wales, UK. Since then, he has been active researcher on exact and approximate solutions of Einstein's field equations, with many papers presented at international conferences and published in international journals, including "Classical and Quantum Gravity" and "General Relativity and Gravitation". In 2000, he obtained the "Award of the Egyptian National Mathematics Committee" for the best research paper in applied mathematics. In summer 2001, he was a Visiting Fulbright Scholar at the University of South Carolina, Columbia, SC. Salah Haggag is a Professor of Applied Mathematics at Al-Azhar University, Egypt. In 2001 he obtained a leave to work at Qatar University. Currently, he is the chair of the Math and Science Department, Academic Bridge Program, Qatar Foundation for Education, Science and Community Development.

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Teacher Training in Mathematics

Name: Mohammed Azhar Hussain
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Abstract: The training of teachers is an essential component of any process of mathematics education and cannot be overemphasized. Teacher training is increasingly seen as a *continum*, of which pre-service and in-service programmes form integral related parts. So that future programmes can be meaningfully planned, it is necessary to look back and take stock of what we have been doing, how far we have been able to achieve our objectives, and what have been the major problems faced. The present paper is an effort in this direction dealing with various facts of the problem of teacher training at all levels.

Short Bio: Dr Mohammed Azhar Hussain is Reader in the Department of Mathematics, Veer Kunwar Singh University, Bihar, India. He received his Ph.D. from Banaras Hindu University, Varanasi, India in 1979. His research interests include Orthogonal Polynomials, Hypergeometrc Functions, Fractional Calculus, etc. He has more than 30 papers published in different reputed national and internationl journals. Dr Hussain presented more than 25 papers in different national and international conferences. He has also attended the *First International Conference on Mathematical Sciences at Al-Azhar University, Gaza, Palestine* and the *7th International Pure Mathematics Conference* at Quaid-i-Azam Universty, Islamabad, Pakistan. He has supervised Ph.D. works of five scholars. Dr Hussain served the university administration as Proctor for two years and also served as Member of the Bihar College Service Commission for three years. Presently, he is Member of the Senate and Finance Committee of V.K.S. University. He is also member of different academic bodies like the American Mathematical Society, the Indian Science Congress Association, and the Indian Mathematical Society. He is editor of the Journal of Patliputra Mathematical Sciences.

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From Discrete Mathematics to AI applications: A progression path for an under graduate programme in Math

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Abstract: Artificial Intelligence (AI) studies the principles and methods of intelligent processes and applies them to computer-based systems. There are many real-time applications that depend on AI. The variety of projects carried out underscore the rapid progress made in the last half-century, since John McCarthy, Professor of Mathematics at Dartmouth College, coined the term Artificial Intelligence in 1956.

Mathematics has proved to be indispensable for understanding and formalising AI techniques as well as to develop robust AI-based systems. When the existing mathematical tools are not adequate to meet the requirements, new ideas are explored. Logic plays a major role in such developments. Thus AI has proved to be a challenging area of application for mathematicians.

Given this scenario, how does one design a curriculum in Mathematics that builds the skills and knowledge required to formalise, design, and develop AI systems with a deep understanding of the Mathematics involved? Although several pathways can be considered, it is important to incorporate the three essential aspects of AI: the fundamental concepts of AI, the computational language concepts that support AI and applications of AI.

In this paper the advantages of proceeding along a path which begins with a module on Discrete Mathematics and moves progressively to logic, Vienna Development Method (VDM) as well as Prolog and ends up in a project involving AI applications is considered. The benefits of such a path of progression, different exit points, the skills that a learner would have acquired at each exit point and the requirements to do such a programme are discussed in detail. This is joint work with Dr Narayanan T. Ramachandran, Middle East College of Information Technology, Sultanate of Oman.

Short Bio: Dr. Abdul Huq received his PhD from the University of Madras, India. He is currently Head of the Department of Mathematics and Applied Sciences at Middle East College of Information Technology, Sultanate of Oman. His research interests include Artificial Intelligence, Software Engineering and Statistical Pattern Recognition. He has published several papers and has authored books on Computing. Dr. Narayanan T. Ramachandran received his PhD from the University of Madras, India. He is currently Dean of Middle East College of Information Technology, Sultanate of Oman. His research interests include Simulation studies, Optimisation techniques and Software Engineering. He has published several papers and has authored books on Computing.

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Interdisciplinary Programs Involving Mathematics:
From permeameter experiments to optimal shape design using *Mathematica*: teaching module in Fluid Mechanics (SWAT4310), Groundwater Hydrology (4400) and Special Problems (4900)

Name: Anvar Kacimov Email: anvar@squ.edu.om
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Sultan Qaboos University
Muscat, Oman

Abstract: Experience in working out mathematical concepts (partial differential equations and calculus of variation) within an agricultural curriculum is shared. The major points advocated are: a) In a non-mathematical specialization with 2-3 math courses in the whole program teaching should be based on computer algebra (e.g. *Mathematica*) and multimedia facilities; b) Engineering courses should juxtapose an experimental part in laboratory sessions (the applied motivation of the problems should be clear to a farmer) with computer modeling; c) Class participation should stipulate a well-structured set of indicators of students' dexterity in basic mathematical and engineering skills; d) Graduation of students should be preceded by a comprehensive exam, with basic topics in all courses structured as Engineering, Mathematics and/or Physics; e) International standardized evaluation of students' mathematical and engineering skills should be launched. An example of integrative approach in teaching is given as a small project conducted in the College of Agriculture with experimental design and mathematical modeling of a problem of seepage flow in vicinity of impermeable objects imbedded in sandy beaches. This is joint work with Ishak Al-Anqoodi.

Short Bio: MSc, PhD in Fluid Mechancis, Kazan University Associate Professor, SQU, 1998-present

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Experiences in Developing a Quantitative Reasoning Program for Students at Zayed University

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Abstract: This paper will take the form of a work in progress. It will trace the development of a quantitative reasoning program, comprising three courses, which all students in Zayed University must take, either wholly or in part. We started from the initial belief, held by several faculty members, that there needed to be a change in the content and style of the mathematics courses that had been taught at the University from its beginning. These courses were the same courses which can be seen in almost every university or community college catalogue in the US as required general education courses. It was felt that, since, for the majority of our students, the last of these courses would be a terminal course, and a new approach was needed. We wanted students to understand that mathematics was more important than many of them had been led to believe by their experiences in high school and that mathematics had relevance to their lives. This would require, not only changing the content of the courses, but also adopting a new philosophy of teaching from the traditional methodology of theory - example - exercises, to a more constructivist approach, in which theory was arrived at after concrete, 'real life' examples were explored. The paper will outline the rationale behind the original program, the reaction to the philosophy and content of the program within the department and describe the status of the program at present. In conclusion we will report the findings of three US mathematicians/educators who visited the University, acting as consultants, charged with evaluating the program and advising the university on ways of improving it. The result of two of the consultant's second visit has been the development of a new program, which is expected to be in place by autumn 2008.

Short Bio:

Nakhshin Karim, MSc, graduated from Imperial College of Science, Technology and Medicine, University of London, UK. She has a diverse experience in teaching, curriculum development and research in mathematics. Currently teaching at Zayed University, United Arab Emirates.

John Wakefield, M. Phil. University of Salford, UK. Currently, Instructor in Mathematics at Zayed University. Previously: Academic Course Director for BSc (Hons) in Applied Mathematics with Computing at Salford University, UK; Director of the Mathematics Learning Systems Institute and Director of the Mathematics Learning Resource Centre Salford University, UK.

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Learning Mathematics in General Foundation Program: Proposed Omani Initiative

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Abstract: Learning Mathematics is an important task and a huge challenge at all levels of education, in particular at secondary and higher education level. World wide higher education institutions (USA, Canada, UK, Australia, South Africa and others) have been working in this direction to define objectives, goals and came with appropriate strategies in order to overcome the challenge.

In this direction, Oman is taking an initiative and with the coordination of the Ministry of Higher Education, Sultan Qaboos University and Oman Accreditation Council a Symposium on "Towards National Standards for Foundations Year Program" was held on 16-17 January 2007 at SQU.

In this presentation, we will give an overview on the process of the Foundation year Program and its different subject areas.

We will only, consider the Mathematics area and present an overview of the objectives, assessments, mode of delivery, the working group team, and the final draft version delivered during the last symposium.

Short Bio: Dr Sebti Kerbal, Sultan Qaboos University, Department of Mathematics and Statistics, Muscat, Oman. Sebti Kerbal received his PhD in Applied Mathematics in 1998 from Ottawa University, Ottawa, Canada. From January 1999 to May 1999, Dr. Kerbal spent a semester as lecturer at the school of information technology and engineering in Ottawa University. From 1999-2003, Dr. Kerbal was Assistant Professor at UAE University in Al-Ain, UAE. In August 2003, Dr Kerbal joined Sultan Qaboos University as an Assistant Professor at the Department of Mathematics and Statistics. Dr. Kerbal was course coordinator of pre-calculus from 2004 to 2006, chairman and member of pre-calculus course content committee, and calculus courses content revision committee for the year 2005-2006 as well as a faculty member in the e-Learning and online mathematics course development at Sultan Qaboos University.

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Numerical Calculus using Microsoft EXCEL

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Abstract: Numerical calculus can be done using calculators, ready made packages or programming languages. Spreadsheet programs are powerful programming and graphical analysis tools providing a middle course between the ready made packages and the programming languages. In this paper we shall discuss the advantages of using the spreadsheet-oriented techniques for numerical methods. We shall describe in detail how the ubiquitous Microsoft EXCEL can be used to do numerical calculus, with appropriate examples. EXCEL enables numerical analysis in an easy and lucid manner requiring no prior knowledge of computer programming.

Short Bio: Dr. Sameen Ahmed Khan is an Assistant Professor at the Salalah College of Technology, Salalah, Sultanate of Oman. He did PhD in Mathematical Physics from the Institute of Mathematical Sciences, Chennai, India. He did Post-Doctoral research at the Istituto Nazionale di Fisica Nucleare (INFN), Padova, Italy and Universidad Nacional Autonoma de Mexico (UNAM), Cuernavaca, Mexico. Besides a carrier in physics, he has a keen interest in Education and "Science for Development". Further details at http://www.geocities.com/rohelakhan/ and he can be reached at: rohelakhan@yahoo.com

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The Computer Algebra System Maple as a Pedagogical Tool for Teaching Calculus

Name: Suheil Khoury Email: skhoury@aus.edu
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Abstract: The current trend in teaching mathematics, particularly calculus, is based on the *"Rule of Three."* This rule reflects the philosophy that teaching and learning of math concepts should be based and enhanced by algebraic, numerical, and graphical methods. In most situations, it is more convenient to understand a concept or work a problem graphically and/or numerically using a Computer Algebra System (CAS) such as Maple. Consequently, technology should be integrated throughout calculus courses to provide a balanced approach to the teaching and learning that involves numerical and graphical methods.

We examine the shift in the teaching methodology of College level calculus from a classical mathematical analysis course to a CAS based course, where emphasis is placed on developing critical and analytical thinking skills, and problem solving skills based on the rule of three. Many universities around the world are increasingly following this approach; they have created a technology-supported learning environment in order to turn the all-too-often passive school experience into one of active participation.

We present our own experience of the last eight years incorporating Maple into the math curriculum at the American University of Sharjah. In particular, we present the ways in which the introduction of CAS as a support tool led to a change in the main teaching philosophy and learning platform, and curricula of College level calculus courses.

Short Bio: Suheil A. Khoury is Associate Professor of Mathematics at American University of Sharjah (AUS). He obtained his PhD in 1994 from Michigan State University. His research interests include Mathematical Physics, Fluid Dynamics, and Computational Mathematics.

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Learning Objects for Java Programming Language

Name: Ion Mierlus-Mazilu Email: mmi@mail.utcb.ro
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Abstract: *Learning Objects* are interactive visualizations of program code examples or programming tasks. They have been developed to help students to understand programming structures more easily. A Learning Object can cover any specific programming problem in any programming language. Learning Objects can also cover the problem-solving logic at the algorithmic level. A learning object focuses on one specific learning goal. Each learning object has to be independent, without links to other objects or resources. Thus for example, server-side generated webpages are not valid as Learning Objects. This independence ensures the real reusability of a learning object. To improve the progress of the students of programming language courses, visualization learning objects are produced and used as learning material. In some institutions the students have different study backgrounds. Some come to the course with non-theoretical and some with theoretical studies behind them. The focus is set on the differences in the effects of program visualization learning objects on the student's course results.

Short Bio:

- Assistant Professor at Department of Mathematics and Computer Science, Technical University of Civil Engineering, Bucharest;
- Doctor's degree in mathematics, specialization in Mathematical Statistics And Probability, Faculty of Mathematics, Bucharest University ("Simulation Models with Applications in buildings reliability");
- member in Romania Probability and Statistics Society;
- member in Romania Operational Research Society;
- coordinator in Romania on international project "Codewitz - better programming skills".

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Transforming Students' Approaches to Learning and Applying Mathematics

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Abstract: The increasing scope of curriculum content, time restraints and gateway assessment require mathematics teachers to actively explore alternative learning strategies in order to effectively address students learning needs. In addition to teaching course-specific objectives, teachers are often expected to directly address graduate outcomes at each stage of planned learning experiences. A co-operative learning approach is one effective strategy to meet course specific objectives whilst addressing the requisite holistic outcomes to help students be competitive in today's work environment.

This paper discusses an approach utilized to integrate mathematics within the interdisciplinary Foundations program: Computing, Research Skills and Projects (CRSP), at Dubai Men's College (DMC). The CRSP course, originally developed to address English language and research skills objectives, has been designed with the intent of transforming students'attitudes and approaches to learning. CRSP is a blended learning course delivered through fifty percent face-to-face sessions, and fifty percent through the learning management system, WebCT. The latter effectively incorporates the meaningful application of learning technologies such as audio, video, animations, applets and online quizzes. Mathematical tasks have been integrated in such a way as to exploit the course's instructional design strategies, as well as its inherent adherence to adult learning principles and learning technologies. Mathematic objectives are dynamically related to other disciplines by providing relevant tasks within authentic contexts. Students develop new mathematical understandings, critical thinking and decision making skills that build on and enrich their knowledge, application and appreciation of mathematics. These active learning experiences then provide the opportunity for students to effectively transfer skills, knowledge and attitudes to Math-specific Foundations courses, as well as in subsequent years of study. This paper will refer to research findings which indicate that students who complete the CRSP course have positive attitudes to the learning of mathematics and are better able to solve problems requiring mathematical skills outside the classroom.

Short Bio:

David Moran teaches math and research skills at Dubai Men's College. He is interested in instructional design, blended learning, and pedagogical issues associated with online learning.

Hazel Owen teaches at DMC, advises on CALL issues, and develops blended learning courses. A PhD candidate with USQ, she's researching the effectiveness of CAL applied within a sociocultural framework.

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Developing Double Major Programmes with Math as one: Challenge and Response

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Abstract: In the past demands from the market, new opportunity areas, and national strategies were important drivers to developing new academic programmes. With quality gaining acceptance and importance in the Higher education sector, academic programmes are developed to meet the requirements of National Qualification framework or such other prescriptions as may exist. Furthermore, institutions look forward to benchmarking their programmes. All these have made curriculum development more interesting and challenging.

In the context of modules and programmes that involve Math, curriculum development is exciting as different specializations weave around various subject areas in Math, starting from the basics to advanced topics such as Elliptic Curves and Integral Transforms. Recent developments in the computer industry have made it attractive to graduates with Mathematics major. While the rigorous training in Mathematics places them on a good footing, the need of the industry will be better served if these graduates have a stronger background in the actual application that they are required to work on. A double major degree programme will cater to both the interests of the students and the needs of the industry. The second major in such scenarios can be Image Processing, Artificial Intelligence, Cryptography, Computer Graphics, and so on.

The curriculum structure needs to take into account the core modules mandatory for all the students of the institution, the support modules from other subject areas, modules for a major in Mathematics, and modules from the second major apart from optional modules. Moreover, exit at different points and associated skills and knowledge must be considered. All these add to the care and expertise with which the curriculum needs to be developed.

For the purpose of developing such a double major programme, a central repository of subjects will be useful. This repository, with modules at various levels with different learning outcomes, will serve as a tool to developing several programmes with different specializations. While the ownership of different modules within the repository will lie with the departments, the common qualification framework will be the main tool to bring about the overall balance in the curriculum structure. In this paper we discuss the challenge of developing such a curriculum and our response to it. Joint with with Dr. Abdul Huq, Middle East College of Information Technology (MECIT), Sultanate of Oman.

Short Bio: Dr. Narayanan T. Ramachandran received his PhD from the University of Madras, India. He is currently Dean of Middle East College of Information Technology, Sultanate of Oman. His research interests include Simulation studies, Optimisation techniques and Software Engineering. He has published several papers and has authored books on Computing. Dr. Abdul Huq received his PhD from the University of Madras, India. He is currently Head of the Department of Mathematics and Applied Sciences at Middle East College of Information Technology, Sultanate of Oman. His research interests include Artificial Intelligence, Software Engineering and Statistical Pattern Recognition. He has published several papers and has authored books on Computing.

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e-Learning of the English for Basic Mathematics

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Abstract: This talk describes on-line self-access mathematics vocabulary materials presenting basic mathematical terms in English.

Problem and Solution: The need for students to build Mathematics vocabulary in English was identified by professors in the Mathematics Department. Classroom research showed that while students know basic mathematics concepts, they lack even the most elementary mathematics words in English. Adding a mathematics vocabulary component to the very full Language Centre curriculum was not possible, so a self-access format was chosen.

The Materials: The aim of the materials is to introduce students to the meanings and pronunciation of mathematics words using texts, pictures and audio files. Quizzes allow students to test their reading and listening comprehension of the words. There is also a module covering strategies for understanding "word problems."

Problems and Reactions: Making the materials engaging was a challenge. It was not possible to avoid a heavy reliance on text to present words. This was due to the developer's limited computer skills and the constraints of the Hot Potatoes authoring software. Also, it was found that teachers want an assessment component built in, with tabulated results.

This is joint work with Mr. Bill Huguelet and Ms. Kim Vaughn.

Short Bio: I am e-Learning coordinator for the Language Centre at Sultan Qaboos University. I currently develop e-Learning materials for a variety of general and specialist English courses at SQU. I have a background in Psychology (BSc. Manchester, UK), statistics and Information Technology Management (MA from Sheffield, UK). I have taught statistics courses at Camosun College (Victoria CA) and Coleg Harlech in Wales in the past.

Mr. Bill Huguelet of the SQU Language Centre has been teaching EFL for 24 years in different countries around the world. Now focusing on EAP programs, especially for students in sciences and engineering.

Ms. Kim Vaughn of the SQU Language Centre has been teaching EFL since 1982 in Asia, the Pacific, Europe and now the Middle East. Current interests include content area EFL teaching and materials.

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The Traditional Calculus Sequence under Mounting Technological Change

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Abstract: The standard entry point to the study of mathematics at most US-based colleges and universities has for many years been the traditional calculus sequence of courses. While having stood the test of time, this sequence is by no means impervious to the influences brought about by recent technological advances. In this presentation we discuss how the introduction of an affordable, hand-held, computer algebra system in the form of the TI-89 graphics calculator has affected the traditional calculus sequence, within an engineering service teaching setting, when no restrictions on student use are imposed. In particular, we examine how its introduction has influenced what is taught and how such courses are assessed. We also highlight some of the many challenges faced and how its addition into a required course sequence has been perceived by others, particular by our engineering colleagues who are the recipients of all those we teach. Finally, we indicate how the overall impact brought about by the introduction of the graphics calculator has contributed to an evolving calculus sequence and discuss whether or not we see such changes as representing pedagogical improvements.

Short Bio: Sean Stewart teaches mathematics and physics to undergraduate engineering students at The Petroleum Institute in Abu Dhabi where he is an Associate Professor in the Core Program. Before moving to the United Arab Emirates he taught pre-university mathematics and physics foundation courses in Australia for a number of years.

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Dynamic Learning with Kinetic Connections

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Abstract: "Learning is not attained by chance; it must be sought for with ardor and attended to with diligence." - ABIGAIL ADEMS

It is the need of the hour that learning has to be dynamic in the classrooms. The behavioral outcomes in the classroom as well as out of the classroom need to be considered in the learning process. This dynamic learning environment could be made available to the students in e-Learning. The teacher in the classroom and the learning experiences provided are playing a vital role in the learning process. The *World Wide Web* (WWW) which is kinematical in nature provides the learning experiences in line with Bloom's Taxonomy, making the classroom environment more dynamic. The teacher and the student are generally very active in the process of learning. An inquiry based classroom environment could be created by the teacher and the student might assume an active role in organizing, presenting and in transferring the knowledge in the process of learning. The classroom becomes student centered rather than in the traditional system. Lessons could be designed carefully to guide the students by exploring the contents. Websites could be developed that contain "virtual manipulatives". All physical actions like sliding, flipping, turning, and rotating could be controlled by using these manipulatives. A virtual manipulative has the power to make visible that which is hard to see and impossible to imagine. These virtual manipulative provided by the WWW are kinematic connections, making the learning dynamic. Bloom's Taxonomy is also revised with a few significant changes in the cognitive and affective learning to improve thinking in knowing what it is?

Joint work with Dr. S.M. Rizwan, Mr. P. Mahalingam, Mr. Ahmed Mohiuddin, Department of Mathematics and Science Caledonian College of Engineering, Oman.

Short Bio: Ramanathan Subramanian is presently working as a Senior Lecturer in Caledonian College of Engineering, Oman. He has about 33 years of teaching experience in mathematics and held various important positions within the college.

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Mathematical Modeling and Mathematica: A Case Study

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Abstract: Numerical methods form a large branch of modern mathematics. They were developed in order to solve practical problems in science and engineering. Without these methods, even very simple and ordinary engineering problems could not be solved.

In this presentation, *Mathematica* is used to solve the differential equations of motion of a projectile moving under the influence of gravity in the presence air resistance. After observing that the solution function cannot be solved for the time of flight, Newton's method is introduced and implemented with *Mathematica* to obtain the desired result.

Short Bio: PhD University of North Texas, USA. Area of research, topological dynamics and nonlinear dynamical systems. Assistant Professor, Department of Mathematical Sciences, United Arab Emirates University.

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Mathematics and Civil Society

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Abstract: People believe, Mathematics is a divine discipline. Some love Mathematics, while some fear it; some study Mathematics, while some worship it. Ancient Indian Mathematicians like Aryabatta or Bhaskara worshipped Mathematics and lived for it. It was not for any material benefit, but was out of their devotion. Again, the legend Srinivasa Ramanujan of India was a man who adored Mathematics. All over the world, there were and there are people who loved Mathematics as a divine subject. Hence it may be a very interesting topic of research, that how Mathematics affects the Civil Society. We know that Mathematics plays a very important role in the Modern World. Mathematics cannot be considered as a class room discipline only. Every man may need it at any time. Not only an Academician; not only a Scientist; not only an Engineer; but, a shopkeeper needs it; a grocer needs it; a house wife needs it; a sportsman needs it; an employee needs it; and who does not? Just like a language, we need Mathematics to communicate! So the Mathematics that we teach in the class room should cater the need of every individual. There is no need of teaching Higher Algebra or Topology to a grocer. A house wife does not need the statements or proofs of real Analysis. In this paper, the authors wish to discuss these matters in detail. The need of formulating a curriculum which suits the need of different types of people is studied. The paper is based on a survey made in a locality of Trivandrum, which is one of the State-Capitals of India. Opinions from experts are also used to develop the paper. This is joint work with Dr. Mary George, Mar Ivanios College, Trivandrum, India.

Short Bio:

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Teaching Cryptography with Mathematica Package

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Abstract: Cryptography courses are very popular among students around the globe. I started this teaching subject in Oman together with Dr. Abderezak Touzene via supervision of two completed Master Projects (by Huda Al Naamani and Rahma Al Habsi). The topic was the implementation of graph based symmetric encryption algorithm. In fact it was the first step to interesting further research (see [2], [3], and [4]). So I think that this interdisciplinary area could be used effectively for the enhancement of students research. Modern Cryptography course naturally can be conducted in parallel with leaning Mathematica. Symbolic computation can be used effectively for the implementation of examples of polynomial public key algorithms, like known example of Imai-Matsumoto method and its generalizations (see [1]). Graphs given by polynomial equations can be useful for good cryptographical applications of Mathematica.

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Personal Experience on Online Mediated Learning Courses Both at Qatar and Maryland University

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Abstract: This article reflects a personal experience with e-learning (online classes and mediated learning lab). E-learning had a significant effect on the attitude towards learning mathematics and statistics. Students were very enthusiastic about e-learning and most of them commented that the time passes fast in the lab. Students like the virtual office hours more than real setting office hours. Some comments of the students are: "Why can't we have all our courses online? It is more convenient than the traditional setting. We don't have to carry notes or textbooks when we study in group." Special comments from students in the Middle East were, "We have learned English as we learned statistics from the online course." The limitation of this experience is that it was based on introductory courses only.

Short Bio: Dr. Adil Yousif is Associate Professor at the Department of Math and Physics, University of Qatar. He received his PhD in Statistics from Ohio University in 1997.

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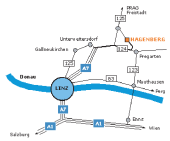

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