

President's Message

Let's Do the Math!

As I reminisce the highlights of the past two years, I am reminded of the famous quote by Newton, "If I have seen further it is only by standing on the shoulders of giants." Without a doubt, every step forward for our organization has been a result of the efforts and ingenuity of members and friends of TexMATYC for the past 32 years. We are math educators who share a common goal of promoting mathematics education. We are members of a professional organization recognized for our expertise in teaching two-year college mathematics.

The annual joint conference has proven to be a winner for all parties. This yearly event is the product of visionary leaders who have, for more than a decade, cooperatively planned and promoted the program. Our new logo, the proposed course descriptions updates, changes in the

bylaws, and other tasks were all made possible by the collaborative efforts of the membership and the executive board, both past and present. Success is definitely a team effort in our business!

It is likely that the second decade of the third millennium A.D. will be a time of great change in mathematics education. On the horizon are two initiatives: 1) the AMATYC New Life for Developmental Math Project and 2) the Statway Project from the Charles A. Dana Center and the Carnegie Foundation for the Advancement of



Paula Wilhite

Teaching. Driven by significant modifications in funding and innovations in technology, the next ten years will mark dramatic changes in our approach to mathematics education. The opportunities to be a part of this historical change are endless.

Thank you for all that you do to enhance mathematics education and improve the success of your students. We as a community and as individuals have both the expertise to help students master the frequently difficult concepts of mathematics and the power to change the lives of thousands. We must embrace the coming changes in the new decade.

Join the ranks of math educators who lead Texas and thus lead the nation in promoting mathematics education. Let's do the math to meet the needs of our students in this new era.

Together we will make a difference for all students!

Paula A. Wilhite
Northeast Texas Community College

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Texas Mathematical Association of
Two-Year Colleges. Affiliate to the
American Mathematical Association
of Two-Year Colleges.

Election Results

Congratulations to the 2010-2012 TexMATC Executive Board!

New Board Members:

President: Raja Khoury

Immediate Past-President: Paula Wilhite

President-elect: Sharon Sledge

Treasurer: Habib Far

Secretary: Heather Gamber

Constitution Changes:

The proposed changes to the bylaws and constitution were approved by 89.5% of total votes.

Article V - Officers and Executive Board

a) The officers of this Association shall be President, Vice President, President-Elect, Immediate Past President, Secretary and Treasurer. The President-Elect automatically succeeds the President at the end of his/her term or when the President leaves office permanently.▪

Proposed Course Description Updates Approved

In 2008, TexMATYC began a review process of the HECB Lower Course Guide Manual by forming the Course Description Ad Hoc Committee. The committee found needed revisions for the Intermediate Algebra Course Description and the College Algebra Course Description. During the 2009 TCCTA/TexMATYC conference, the committee members met to draft new course descriptions.

The descriptions were designed to provide a minimum of topics for inclusion in each course, allowing each college to expand and extend their individual courses as desired. The proposed revisions were presented at the fall 2009 TAAAMS (Texas Association of Academic Administrators in the Mathematical Sciences) and at the 2010 TCCTA/TexMATYC conference. In April, the descriptions were approved by TAAAMS at the 2010 Texas Section of MAA meeting.

An online survey was conducted during the last two weeks in April for math faculty of two-year colleges to voice their opinions and comments. The following results will be forwarded to the HECB by the committee:

Proposed NEW College Algebra Description: Study of polynomial, radical, rational logarithmic, and exponential functions with applications; data analysis; systems of equations; and matrices.

Proposed NEW Intermediate Algebra Description: Study of sets; relations and functions, factoring; rational and radical expressions; graphing; solving linear equations, and inequalities, solving quadratic equations; applications.

| For/Against | Responses # | Response % |
|-------------|-------------|------------|
| For | 61 | 91.0% |
| Against | 6 | 9.0% |

Committee Members:

Sharon Sledge (Chair) - San Jacinto College

Randal Hoppens - Blinn College

Anna Maria Mendiola - Laredo College

John Gresham - Ranger College

Joanne Peebles - El Paso College

Elise Price - Tarrant County College

Paula Wilhite (Ex-Officio) - Northeast Texas Community College

Advisors from Universities:

Robert Payne - Stephen F. Austin University

Blair Sterba-Boatwright - Texas A&M Corpus Christi

Mark Thornburg - McMurry University▪

| For/Against | Response # | Response% |
|-------------|------------|-----------|
| For | 56 | 86.2% |
| Against | 9 | 3.8% |

TexMATYC Congratulates Austin CC Student Math League

First-place Team - Southwest Region

For the past four consecutive years, Austin Community College (ACC) has placed first in the Southwest Region in Student Math League (SML) team competition. ACC has been active in the Student Math League of AMATYC for many years. According to Tony Vance, Coordinator of the SML, much of the credit for this success goes to Mike Dellens, now retired and adjunct professor. Dellens first led the efforts to offer financial awards to the winners. In the past, small prizes such as calculators or math books were awarded, but now the prizes are monetary -- and student involvement has dramatically increased! After Dellens retired, Vance assumed the role as organizer of the contest.

Between 50 and 90 ACC students participate in the contest every semester at seven different campuses within the Austin Community College District. The student competitors are enrolled in math classes from College Algebra

through Multivariate Calculus and Differential Equations. Some are high school students, enrolled at ACC through Early College Start, while others are older, non-traditional students. There are two or three practice sessions before each round. At these sessions, students review problems from previous contests and then discuss strategies for solving these types of problems. The practice sessions are fun and instructive for both students and faculty.

TexMATYC sends a sincere and hearty congratulations to the first place Austin Community College Student Math League winners! We applaud your success!

More information about the AMATYC Student Math League is located at <http://www.amatyc.org/SML/index.htm>.



Second round of winners: (front row from left): Jackson Featherston, Federico Alvarez-Campana, Kailynn Balkum, Bradley Neuse and Alexander Balkum (back row from left): ACC Board of Trustees member Dr. James McGuffie, ACC Foundation Board member Cassandra Wiggins, ACC President Dr. Stephen B. Kinslow. Not pictured: student winner Bethany Sims.

From the Desk of...

Jack Rotman, Project Leader AMATYC "New Life" for Developmental Math

Lansing Community College

For the past year (and a little more), the AMATYC New Life for Developmental Mathematics project has been working to develop new ideas -- not just small improvements, rather a new approach to bring significant changes to the profession ... to bring better results for our students ... and to bring a fresh hope to faculty long discouraged by the old system. (Some of you have attended presentations on this work at the AMATYC conference or at local events.)

I am sending you this note to encourage you to do two things. First, use the links below to find out what the New Life project has been working on. Second, forward this note to others at your college and in your region who are involved with developmental mathematics. (Materials are not limited to AMATYC members.) Home page for the model is located at <http://dm-live.wikispaces.com/>.

The four basic documents describing our new vision of mathematics preceding college-level are posted at <http://dm-live.wikispaces.com/Basics+Of+New+Life>.

A series of presentations (with audio) providing additional background on the project and our vision is available at <http://dm-live.wikispaces.com/NewLifeGuide>.

The "Implementer" page is located at <http://dm-live.wiki->

spaces.com/ImplementerCentral, and this page serves two purposes. First, it provides some guidance on how to get started on creating a new curricular model at your institution, including references. Second, it provides information for those considering a pilot of a new course like "MLCS" or "Transitions" (the second course) concerning data collection and faculty development.

Materials from last fall's Symposium on Developmental Mathematics (AMATYC Las Vegas conference ... Rosemary Karr & Jack Rotman), including a video of the symposium, the presentation slides, bibliography, and handouts can be found at <http://dm-live.wikispaces.com/Symposium2009>.

I hope you will find the time over the next few weeks to explore these materials; we have several colleges working towards a pilot course in 2011 -- perhaps you will find yourself engaged in that work, or supporting colleagues in the process. We understand that fundamental change takes time AND the effort of a community; the community is us ... the community of mathematics faculty at CCs. Thank you for your time!

Contact Jack Rotman at rotmanj@lcc.edu.

TexMATYC Annual Financial Report for 2009

Habib Far, Treasurer

| Description | Expenses | Income |
|--------------------|----------|------------|
| Previous Balance | | \$7,509.26 |
| Membership | | \$968.00 |
| Workshops | | \$325.00 |
| Interest | | \$28.65 |
| AMATYC Hospitality | \$100.00 | |
| Plaques | \$45.20 | |
| Web-Site | \$20.00 | |
| Balance | | \$8,665.71 |

The Music of the Spheres

James Galloway, Collin College

From the earliest days of western mathematical development, music and math have been perceived as related disciplines. Pythagoreans believed that one could grasp the secrets of the Universe through the understanding of mathematics and music. They spoke of the “music of the spheres”, suggesting that bodies moving in space produce sounds and that the Universe in essence sings with music. Plato also discussed this idea in some of his writings, including *The Republic and Timaeus*. Later, Johannes Kepler also discussed the theory of the music of the spheres, stating that planets produce sounds based on their velocity.

It is easy to demonstrate mathematically that there is literally a music of the spheres. A musical tone can be associated with any kind of periodic motion, including the motion of the planets, using what is known in music theory as the Law of the Octave.

In music theory, each note or tone is defined by its frequency in cycles per second or Hertz. For example, the concert pitch for A above middle C is 440 Hertz. The following table (Table 1) gives the concert pitch for the notes on a standard piano:

Table 1: Frequencies of Notes in Hertz

| Note | Frequency (Hertz) |
|------|-------------------|
| A | 110.0 |
| A # | 116.5 |
| B | 123.5 |
| C | 130.8 |
| C # | 138.6 |
| D | 146.8 |
| D # | 155.6 |
| E | 164.8 |
| F | 174.6 |
| F # | 185.0 |
| G | 196.0 |
| G # | 207.6 |
| A | 220.0 |

If we double the frequency of a tone, we hear a tone one octave above the original tone. Doubling the frequency of 440 Hertz, which is an A, gives a frequency of 880 Hertz. This note is also an A, one octave above the original tone. A frequency of 1760 Hertz would also be an A, two octaves above the original tone. Halving a frequency results in the same note one octave below the original tone. So a frequency of 220 Hertz is also an A.

Frequencies of 110, 220, 440, 880, and 1760 Hertz are considered in a sense equivalent – they all represent a note of A. This doubling or halving of frequency can be continued

indefinitely to give a series of frequencies that are considered equivalent. This is called the Law of the Octave.

Now consider the rotation of the earth about its axis. The earth completes one rotation about its axis in 1 day. This represents the frequency of the rotation of the earth about its axis. By simple unit analysis, this frequency can be converted from cycles per day to cycles per second (Hertz):

$$\frac{1 \text{ cycle}}{1 \text{ day}} \times \frac{1 \text{ day}}{24 \text{ hours}} \times \frac{1 \text{ hour}}{60 \text{ minutes}} \times \frac{1 \text{ minute}}{60 \text{ seconds}}$$

$$= 0.000011574 \text{ cycles per second.}$$

This frequency is not in the audible part of the frequency spectrum, so we don’t “hear” the earth rotating (frequencies are audible in the range from approximately 20 Hertz to 20,000 Hertz).

However by the Law of the Octave, this frequency can be converted to an equivalent frequency in the audible range by doubling the frequency 24 times (multiplying by 2^{24}):

$$0.000011574 \text{ Hertz} \times 2^{24} = 194.18 \text{ Hertz}$$

From Table 1 we can observe that this is approximately a note of G.

Any astronomical cycle (rotation of a body about its axis, revolution of a planet about the sun) can easily be converted to an audible musical tone using unit analysis and the Law of the Octave.

The following table (Table 2) gives the musical frequency for some of the astronomical cycles that occur in our solar system:

Table 2: Tones of the Solar System

| | Period | Frequency | Note |
|---------------|-------------|-----------|------|
| Earth Day | 24 hrs | 194.18 Hz | G |
| Earth Year | 365.242 day | 136.10 Hz | C # |
| Synodic Month | 29.53 days | 210.42 Hz | G # |
| Mercury | 0.24 yrs | 141.77 Hz | C # |
| Venus | 0.615 yrs | 221.30 Hz | A |
| Mars | 1.88 yrs | 144.79 Hz | D |
| Jupiter | 11.86 yrs | 183.61 Hz | F # |
| Saturn | 29.46 yrs | 147.84 Hz | D |
| Uranus | 84.02 yrs | 207.34 Hz | G # |
| Neptune | 167.79 yrs | 207.65 Hz | G # |
| Pluto | 48.43 yrs | 140.25 Hz | C # |

The periods given for the planets in Table 2 are their

period of revolution about the sun.

As a second example, let's look at the planet Jupiter. Jupiter's period of revolution about the sun is 11.86 years.

$$\frac{1 \text{ cycle}}{11.86 \text{ yrs}} \times \frac{1 \text{ year}}{365.242 \text{ days}} \times \frac{1 \text{ day}}{24 \text{ hrs}} \times \frac{1 \text{ hour}}{60 \text{ min}}$$

$$\times \frac{1 \text{ min}}{60 \text{ sec}} = 2.6719 \times (10^{-9}) \text{ cycles per second.}$$

This time we need to raise the frequency by 36 octaves to transpose it to the audible range:

$$2.6719 \times (10^{-9}) \text{ hertz} \times 2^{36} = 183.61 \text{ hertz}$$

Again from Table 1 we can observe that this is approximately a note of F #.

We can take the period given in Table 2 for each of the other planets and confirm the associated frequencies and musical notes.

Pythagorus, Plato, and Kepler were all correct. There is quite literally a music of the spheres!

By similar reasoning, musical tones can be converted to frequencies within the color spectrum. Table 3 gives approximate frequency intervals associated with the color spectrum (note that Terahertz = 10^{12} Hertz).

Table 3 Frequencies for Color Spectrum

| Color | Frequency Interval (Terahertz) |
|--------|--------------------------------|
| Red | 430 – 480 THz |
| Orange | 480 – 510 THz |
| Yellow | 510 – 540 THz |
| Green | 540 – 610 THz |
| Blue | 610 – 670 THz |
| Violet | 670 – 750 THz |

Here is an example of how we can convert a musical note to a color. We know that 130.8 Hz is a C from Table 1. Raise this frequency by 42 octaves:

$$130.8 \times 2^{42} = 5.753 \times 10^{14} \text{ Hz or } 575.3 \text{ THz}$$

According to Table 3, this is in the green part of the color spectrum. A note of C is associated with the color green.

Table 4 gives the correspondence between musical tones and colors. The correspondences in this table are approximate since frequency intervals are not equal for different colors. For example, in the color spectrum the interval for green is larger than the interval for orange.

Table 4: Color Correspondence to Musical Tones

| | |
|-----|---------------|
| C | Green |
| C # | Green-Blue |
| D | Blue |
| D # | Blue-Violet |
| E | Violet |
| F | Violet-Red |
| F # | Red |
| G | Red-Orange |
| G # | Orange |
| A | Orange-Yellow |
| A # | Yellow |
| B | Yellow-Green |
| C | Green |

By applying the Law of the Octave and performing some simple calculations, movements of the planets can be transposed into audible sounds and even colors. Science, mathematics and music combine to confirm that the Universe sings with the Music of the Spheres!

Further Reading:

Math and Music: Harmonic Connections, Trudi Hammel Garland and Charity Vaughan Kahn, Dale Seymour Publications, 1995

The Cosmic Octave: Origin of Harmony, Hans Cousto, Life-rhythms, 2000

New lifetime members

TexMATYC is pleased to welcome new lifetime members **Cassandra Bowell** of El Centro College and **Judy Wagner** of Blinn College in Bryan.

Lecture available online

James Stewart's lecture on "Mathematics and Music", mentioned at the TCCTA/TexMATYC meeting, is posted at:
<http://www.maa.org/news/042810Stewart.html>

AMATYC Annual Conference

www.amatyc.org



In Memory

Dr. Linda Buchanan and Dick Conway



Howard College in Big Spring, TX mourns the loss of Dr. **Linda K. Buchanan** who passed away April 13, 2010 after a valiant 2 1/2 year battle with cancer.

Dr. Buchanan was a math professor at Howard College for almost 23 years. She received her Bachelor of Science and Master of Arts in Teaching from Angelo State University

and her Doctor of Education from Texas Tech University.

She was very active with her students in the classroom, teaching face-to-face courses, on-line courses and serving as a student advisor. Dr. Buchanan was passionate about education and even continued teaching online courses after she could no longer teach in the traditional classroom setting on a day-to-day basis. During her final semester, Dr. Buchanan was teaching statistics online as well as a graduate level math education course for Walden University. She was involved with promoting and teaching early college courses and regularly encouraged

the use of technology in mathematics education.

The Texas Community College Teachers Association (TCCTA) was also a focal point for Dr. Buchanan. She strongly believed in the work of the association and served as a district representative for many years. Each year, she would address her fellow faculty and express the importance for educators to be actively involved with our state and its educational system. She practiced what she preached and continually supported the work of TCCTA.

Dr. Buchanan was greatly respected by her colleagues and was honored as Who's Who Among America's Teachers and was asked to assist in writing and reviewing textbooks and solution materials. Her community and church family were the beneficiary of many hours of her generosity as she was always willing to lend an extra hand to be of service to others.

The Howard College family is deeply saddened by the loss of this truly exceptional educator.

Dick Conway passed away last year. He was an outstanding associate faculty who taught all levels of Mathematics, a great father and a grandfather of many children. He will be missed at Collin College. ■

Conference Photos

TCCTA/TexMATYC Conference March 4-6, 2010: Houston, Texas



Peg Crider, Kathryn Wetzell and Linda Zientek

Workshop - Developmental Education Research and Initiatives: The New Life and the Statway Projects



Uri Triesmann

Featured Speaker - Building a Statway to Heaven



Maria Anderson

Playing to learn math?



Ron Larson

Narrowing the Mathematics Curriculum



Joanne Peoples

Is "e" Really Natural???

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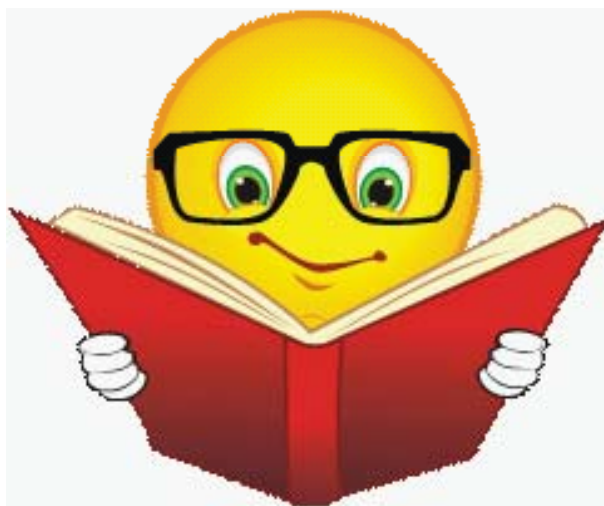
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Visit us at
.....
www.TexMATYC.org
.....

Q: What's the best place to go if you're scared?

A: A math book – there is safety in numbers.



Got News?

**If you know of any exciting news in
Mathematics, have it published in your
TexMATYC newsletter. Submit articles
to:**

Heather Gamber
heather.a.gamber@lonestar.edu

