

# VCTM News

January 2009

*Vermont Council of Teachers of Mathematics*

## President's Message Barbara Unger

I recently ordered a free copy of Foundations for Success, the 2008 Final Report of The National Mathematics Advisory Panel. After being in mathematics education for so many years, I wanted to know more about the Panel's findings. During my years at Middlebury Union Middle School, my district and school worked very hard to give more time to mathematics and to strengthen our mathematics program. Offering algebra in the middle school always was a "hot" topic. Who should be in an algebra classroom and how do we know if students are prepared for algebra? It was a difficult discussion and it often divided the faculty. Elementary teachers in my supervisory union gave hours to improving pedagogy and to learning new standard based curricula. What's next? What else is there to learn about the direction that districts should be taking in mathematics education? Now in 2008, after 20 months of study and review of research, the panel has provided a report that will provide much insight. Here is a small sample of their main findings and recommendations:

**Curricular Content** *A major goal for K-8 mathematics education should be proficiency with fractions (including decimals, percent, and negative fractions), for such proficiency is foundational for algebra and, at the present time, seems to be severely underdeveloped.* Students in my algebra classes more often than not were deficient in their knowledge of fractions. These students were bright but not prepared in mathematics as they should have been for the course of algebra. Unfortunately, the students are the ones to suffer. In addition, the report states that *all school districts should ensure that all prepared students have access to an authentic algebra course.* Whether algebra is taught as a course or in an integrated curriculum, there are major topics outlined by this report that are essential to an authentic algebra course of study. (Continued on Page 2)

### Bob Chaffee Retires as VCTM Treasurer

In 1969 a group of mathematics teachers had a vision for a separate math organization to connect mathematics educator and professional development across the state. Bob Chaffee had a major hand in that creation and he has been an integral part of VCTM ever since. For the last 24 years he has been our trusted treasurer. His service to VCTM, including attending board meetings and conferences, creating impeccable reports and budgets and working with members and students to share his love of mathematics has been wonderful. Bob has given a special life to the organization and his wisdom and sense of humor will missed by all.

Although he has resigned as VCTM Treasurer, Bob is still waving his magic wand in other endeavors in Vermont. He has an important role in many educational and community organizations. Some of his current positions are: Executive Director of the Vermont State Mathematics

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(President's Message continued from Page 1)

*Learning Processes* Experimental studies have demonstrated that changing children's beliefs from a focus on ability to a focus on effort increases their engagement in mathematics learning, which in turn improves mathematics outcomes: When children believe that their efforts to learn make them "smarter," they show greater persistence in mathematics learning. When looking at student work, a teacher must look carefully to see what the student knows. The answer often gives little insight on effort and improvement. In middle school, when I assessed students who were struggling, I often graded them on improvement and effort rather than on how many problems they got right. A student whose assessment score improved from one out of ten correct to five out of ten correct has shown quite an improvement and this improvement must have taken a great effort on the student's part. He/she needs to see the power of persistence.

*Teacher and Teacher Education* Teachers must know in detail and from a more advanced perspective the mathematical content they are responsible for teaching and the connections of that content to other important mathematics, both prior to and beyond the level they are assigned to teach. I loved teaching middle school mathematics and algebra I because I felt so comfortable with the subject matter. I had a very strong background in mathematics so I was prepared for any content question. Being a certified 7-12 mathematics teacher gave me the knowledge base I needed to challenge the students and to remediate the students. I always took advantage of NCTM, ATMNE and VCTM which offer numerous conferences and programs to assist mathematics teachers. VMI is also an outstanding opportunity for teachers to improve content knowledge.

*Instructional Practices* All-encompassing recommendations that instruction should be entirely "student centered" or "teacher directed" are not supported by research. If such recommendations exist, they should be rescinded. If they are being considered, they should be avoided. High quality research does not support the exclusive use of either approach. This was an important finding to me. I have always believed that instructional approaches need to vary. Teacher directed instruction is often necessary for part of a lesson.

You can receive a free copy of the panel's report by contacting: [edpubs@inet.ed.gov](mailto:edpubs@inet.ed.gov) or look on the website: <http://www.edpubs.org>

### **P.A.E.M.S.T.**

Cathleen Newton, Mary Brainard and Melissa Rice have been selected as Vermont state-level finalists by the selection committee for this year's Presidential Awards for Excellence in Mathematics and Science Teaching (PAEMST) Program. As the next part of the selection process, a prestigious national committee reporting to the President will select one teacher for the Presidential Award from the State Level finalists. The state Presidential Awardee will receive \$10,000 and an all-expense-paid trip for two to Washington, D.C., where Presidential Awardees will be honored in a variety of recognition events.

During the coming school year, each of the state-level finalists will be honored at ceremonies during a regularly scheduled meeting of the Vermont State Board of Education.

Nominations are now open for the 2009 PAEMST Award for teachers in Grades 7-12. Go to [www.paemst.org](http://www.paemst.org) to recognize the great teachers you know.

## WEB BYTES from the NCTM Newsletter

SHODOR INTERACTIVE offers interactive activities with coordinating handouts, tables, worksheets, and lessons, as well as written background material to introduce students to mathematics concepts, vocabulary and formulas. [www.shodor.org/interactivate](http://www.shodor.org/interactivate)

ARCADEMIC SKILL BUILDERS includes online educational games for learning basic math, language arts, vocabulary, and thinking skills. [www.arcademicskillbuilders.com](http://www.arcademicskillbuilders.com)

THE NATIONAL SCIENCE DIGITAL LIBRARY (NSDL) is a free online library for K-16 educators that provides organized access to resources and tools that support innovations in teaching and learning at all levels of science, technology, engineering, and mathematics education. [www.NSDL.org](http://www.NSDL.org)

MATH MOTIVATION offers videos and lessons for high school mathematics. [www.mathmotivation.com](http://www.mathmotivation.com)

MATH DICTIONARY FOR KIDS provides more than 600 interactive mathematical definitions for elementary school students. [www.amathsdictionaryforkids.com](http://www.amathsdictionaryforkids.com)

### ***Moody's Mega Math Challenge Expands and Increases Scholarship Prizes***

Online registration is open for the 2009 Moody's Mega Math (M3) Challenge, an Internet-based applied mathematics contest open to high school juniors and seniors in all New England and Mid-Atlantic states, from Maine to Washington, D.C. The real-world math-modeling competition will award scholarship prizes totaling \$80,000 with members of the top six winning teams sharing prizes ranging from \$2,500 to \$20,000. Up to 20 honorable mention team awards of \$1,000 each will also be awarded. The 2009 Challenge weekend is March 7-8, and there are no entrance or participation fees.

High schools in eligible areas may register up to two teams of three, four, or five juniors and/or seniors with one teacher serving as the team's coach. Students choose the day that they wish to work on Challenge weekend, either Saturday or Sunday, as well as the location(s) where they will work. They then have 14 hours to solve an applied math-modeling problem focused on real-world issues. Past Challenge problems have covered areas such as social security solvency, stock portfolios, and the wisdom of replacing gas with ethanol.

A five-minute video providing an overview of the Challenge and footage of previous winners can be viewed at [http://www.youtube.com/watch?v=CIUENL4z2\\_Y](http://www.youtube.com/watch?v=CIUENL4z2_Y).

Conducted annually by The Moody's Foundation and the Society for Industrial and Applied Mathematics (SIAM) as part of their shared commitment to increasing students' interest in studying and pursuing careers in applied mathematics, the M3 Challenge spotlights applied mathematics as a powerful problem-solving tool, as a vital contributor to advances in an increasingly technical society, and as a viable and exciting profession.

The M3 Challenge, which began in 2006 in metropolitan New York City and the surrounding areas, expanded in 2008 to include Boston, Philadelphia, and the environs, sweeping from lower New Hampshire to Wilmington, Delaware. It now encompasses the entire Northeast, from Maine to Washington D.C. In the first three years, approximately 540 teams comprised of 2400 students participated and almost \$200,000 in scholarship prizes was awarded.

For more information, visit <http://m3challenge.siam.org>.

Bob Chaffee (continued from Page 1)

Coalition, Administrator of MathNet, Teacher of a Spreadsheet Course to Senior Net of Vermont, Co-Administrator of Advanced Placement Tests at Essex High School, Justice of the Peace in the town of Essex, Treasurer of the Essex Town Democratic Party. In his spare time (What spare time?) he loves to play bridge with his wife, Mary Ann.

A Vermont native from St. Albans, Bob graduated from UVM and earned his masters from Stanford in 1963. Bob was an outstanding teacher. The majority of his career was at South Burlington High School teaching college prep math courses. In recent years he is especially proud of his tutoring work with Colin Sandon, who as you might recall, was one of six students on the US International Math Team that competed this summer at the 49th Mathematical International Olympiad.

Thank you, Bob, for all you have done and continue to do for Vermont's students and teachers.

## **FRACTALS AS THE MAIN COURSE, NOT THE GARNISH**

Jason Cushner

Students find fractals fascinating. Normally, fractals is shown to be a "cool" application to the concept just learned. What if a unit was organized around fractals, and the math was then organized around understating this interesting phenomenon?

Fractals spark students creativity and curiosity while making connections to art, nature and science. Fractals can lead into many areas of math content, including area, perimeter, exponents, sequences and series, logarithms and complex numbers.

We asked the students to find the perimeter of the continental United States. Upon discussion this brought out the inconsistency when measuring irregular perimeters. How the scale of the map affected the solution. The larger the map, the longer the perimeter the students got. We then set out to find what a fractal is and what are it's uses. The students get to be researchers and our main tool was the internet (which has much higher quality pictures than I could draw). So internet was a key tool in discovering what is a fractal. The internet also has interactive activities to explore fractals and see where fractals are in the natural world.

A benefit to working with fractals is students are working in a relatively new field in math, and can feel like part of the cutting edge in mathematics. A student said, "*It's brave to look at a not completely defined math in high school. This is exploring something you can't control. It's not some structured thing to hand down from teacher to the student.*"

Read the article in its entirety with activities and illustrations at [www.vtmath.org](http://www.vtmath.org)

### *Thank You to David Rome and Bob Kenney*

*You might notice that the VCEM Newsletter is a bit rougher around the edges this time. Our two editors, David Rome and Bob Kenney, have decided it's time to let someone else learn the process. Hopefully, with practice, I will be able to master the software and do nearly as good a job as they have done for more years than any of us can remember.*

# The Elementary Scene

By Mary Calder, Math Content Specialist,

St. Albans Town Educational Center

Note: As many schools implement intervention programs to assist struggling learners, it might be helpful to have a regular column in the VCTM Newsletter to address various topics that we may face in our teaching. I currently am working as a math intervention teacher in my school. There are so many aspects to helping students fill gaps and correct misconceptions perhaps sharing some of the thoughts and ideas that occurred in my setting will be useful to others.

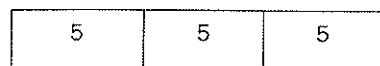
As I worked with several small groups of fourth and fifth graders this year, who have been struggling with math, it became clear that they were having difficulty recognizing the difference between addition and multiplication. Many recent articles and books have discussed *unitizing* where students make the transition from thinking of objects as units of one to units of two, five, ten, etc. This step in mathematical reasoning, where groups of objects are easily recognized and utilized when solving problems, is one place where multiplicative reasoning begins to develop.

These students have spent either one or two years learning about multiplication so my first action was to find out what the gaps in understanding were and what misconceptions were impeding their learning. When asked, "What is the difference between addition and multiplication?" expressing a clear explanation of how these operations are unique was very challenging. Not one student was able to express that in multiplication we think about equal groups of objects. Many of the students stated that the operations were the same except that we used a different symbol between the numbers, writing  $2 + 2 = 4$  and  $2 \times 2 = 4$  as proof. Other responses included that you got different answers because  $5 \times 1 = 5$  but  $5 + 1 = 6$ . Clearly these students didn't really see anything significantly different about the operations other than the symbols and what the answer would be when the equation was solved.

During our next sessions together we worked to clearly understand that both addition and multiplication are combining operations, putting parts together to make a whole group of something. But how the parts look is significantly different – in addition the parts can be any size but in multiplication those parts must be equal! As the students explored ways to break whole numbers into various parts, using Cuisenaire Rods®, writing addition equations for these representations, they began to notice that when all the parts were the same, we could also express the relationship of the parts to the whole with a multiplication equation.

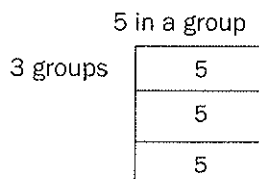
The transition from additive reasoning to multiplicative reasoning is usually taught through repeated addition and then skip-counting with many students easily making the leap to multiplicative thinking, often representing their thinking with an array model. The students in my groups also had difficulty explaining what an array was and how it could help them with multiplication. Often students notice that the total number of units in an array is the same regardless of which factor comes first. However, for the students in my group it was important for them to realize that the order of the factors  $3 \times 5$  and  $5 \times 3$  really are different groupings. In one we have groups of 5 and in the other we have groups of 3 and this may be important for understanding problem situations.

To help build the concept of equal parts the students represented various whole numbers using Cuisenaire® rods of equal value and then moved the rods to make arrays explaining the dimensions of the array as they shared them. The students also recorded their rod representations using the "Singapore Model Drawing" of unit bars for the linear model showing the equal parts and arrays with just the equal groups of 5 shown rather than all fifteen units of one.



15 Units

"Singapore Model Drawing" with a unit bar showing  
equal units of 5



Array Model with dimensions  
showing units of 5

The students began to make progress and eventually were able to identify the most efficient operation - multiplication or addition – to use to solve a variety of word problems.

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VCTM Website: [www.vtmath.org](http://www.vtmath.org)

### Vermont Council of Teachers of Mathematics

#### MEMBERSHIP FORM

The membership year runs from January 1 to January 1.

**Dues:**

VCTM Individual Membership (includes ATMNE membership) \$15.00

VCTM Institutional Membership (allows 3 VCTM/1 ATMNE Conf. attendees as members) \$30.00

NCTM E-Membership (Printed NCTM News Bulletin + 10 journal article dwnlds.) \$48.00

NCTM Membership with one journal (please check the journal of your choice)

\_\_\_ Teaching Children Mathematics \$76.00

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\_\_\_ Mathematics Teacher \$76.00

\_\_\_ Journal for Research in Mathematics Education \$100.00

Each addition journal (+JRME = \$56) \$32.00

TOTAL \_\_\_\_\_ Make check payable to VCTM

Send to: Roberta Cota, VCTM Treasurer, 617 South Main St. Montgomery Center, VT 05471

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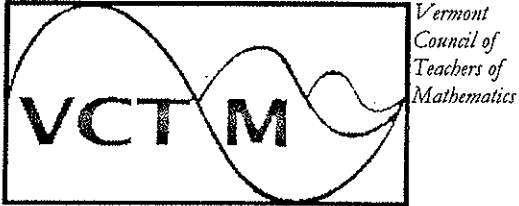
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NCTM



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Thursday, March 19th at St. Michael's College



"What's the Buzz in Math Today?"

[vtmath.org](http://vtmath.org)

Make sure you look at the fantastic workshops being offering in the spring conference brochure.  
This conference contains many in depth workshops that will be a wonderful learning experience.