

## Volume IV Number 4

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### WELCOME TO SIMIODE AND OUR NEWSLETTER

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SIMIODE - Systemic Initiative for Modeling Investigations and Opportunities with Differential Equations is about teaching differential equations using modeling and technology upfront and throughout the learning process. Learn more at our dynamic website, [www.simiode.org](http://www.simiode.org). SIMIODE is now entering its fifth year as a community and its fourth year in publishing this newsletter.

SIMIODE is a 501(c)3 nonprofit organization, based in Cornwall, New York in the United States. Contact: [Director@SIMIODE.org](mailto:Director@SIMIODE.org).

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### NATIONAL SCIENCE FOUNDATION AWARDS SIMIODE THREE YEAR \$450,000 GRANT

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The National Science Foundation Division of Undergraduate Education has awarded SIMIODE a three year grant (15 March 2018 award date) for \$450,000 to promote the use of modeling in motivating and teaching differential equations in high schools and undergraduate institutions. We are pleased at this vote of confidence in SIMIODE as reflected in National Science Foundation funding and we will use the funds wisely to spread the word of using modeling in teaching differential equations.

NSF Funds supported successful [Developer Workshops](#) and [Practitioner Workshops](#) this July at Manhattan College, Riverdale NY USA, and will support comparable workshops in July of 2019 at George Fox University, Newberg VA USA and in July 2010 at Virginia Wesleyan University, Virginia Beach VA USA.

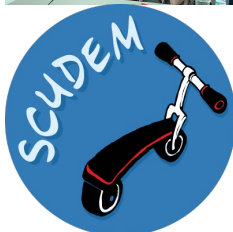
SIMIODE leadership will be supported for travel to national and regional meetings to organize contributed paper sessions, lead minicourses and workshops, and develop community through personal interactions. Further, funds will be used to enrich, enhance, expand, and enable new programs of the [SIMIODE web community](#) on line and to assess and evaluate the effectiveness of the workshops and the overall SIMIODE program to help faculty to use modeling in teaching differential equations coursework.

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### SCUDEM FOR YOU AND YOUR STUDENTS - REGISTER NOW

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SIMIODE sponsors a modeling challenge specific to the pivotal STEM course, differential equations. We call it [SIMIODE Challenge Using Differential Equations Modeling \(SCUDEM\)](#). After our very successful inaugural SCUDEM on 14 October 2017 at Mount Saint Mary College, Newburgh NY USA, we offered SCUDEM II 2018 at 40 sites to over 400 students on 21 April 2018. We report complete results of SCUDEM II 2018.

We offer a [SCUDEM I 2017 video](#) and a [SCUDEM II 2018 video](#) in which students and faculty share their enthusiasm for using modeling in solving solve real problems to learn differential equations. Student interviews are very, we mean VERY, convincing as to the value of this modeling competition in their learning and growth in applying the mathematics they are learning.

At the [SCUDEM I 2017 site](#) and [SCUDEM II 2018 site](#) we offer complete results including

the statement of the posed problems, the additional issues offered on Challenge Saturday, results with all student submissions, award information, way cool [SCUDEM I 2017 video](#) and [SCUDEM II 2018 video](#), a PowerPoint overview of the event, [SCUDEM I 2017 MathBowl](#) and [SCUDEM II 2018 MathBowl](#) fun competitions. Try it. You will enjoy it! You can find answers in the Teachers Group Resources at SIMIODE.

There is also an engaging Faculty Development program offered to support faculty in teaching differential equations courses using modeling to motivate students.

We have announced SCUDEM III 2018, 27 October 2018, with registration from 1 August through 6 October 2018. Register [here](#). **REGISTER NOW.**

We invite schools to be local hosts for SCUDEM III 2018. Hosting schools will receive a stipend (one half registration fees) in support of their contribution. This challenge is for three member teams of students. SCUDEM takes place over a week-long period which will begin with teams selecting one of three modeling problems from physical sciences and engineering, life sciences and chemistry, and social sciences, on Friday, 19 October 2018, at each team's individual home campus, and culminates with team presentations and a fun day of activities on Challenge Saturday, 27 October 2018, at 9:00 AM at a nearby regional host site in the United States and beyond.

Complete information can be found at [SCUDEM](#).

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## FACEBOOK GROUP - SCUDEM MATHEMATICAL COMMUNITY

We invite all to join the [Facebook Group - SCUDEM Mathematical Community](#). See the joy in SCUDEM for students at various locations for SCUDEM II 2018 held on 21 April 2018.

SIMIODE takes the challenge of bolstering mathematical inquiry, reasoning, and application seriously. We encourage group members to share compelling assignments, questions, problem ideas, and modeling scenarios using differential equations with the group. We are interested in ones they have worked on or ones they think would be interesting and need more efforts. All are welcome. So please join us as we continue to grow and share the incredible stories of students and faculty across the world who enjoy exciting applications of differential equations.

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## SIMIODE IS A 501(C)(3) TAX EXEMPT ORGANIZATION - PLEASE SUPPORT US

SIMIODE is a 501(c)(3) tax exempt organization and can accept tax deductible contributions from individuals, corporations, and foundations.

Think of your differential equations course and how applications and modeling would have been so beneficial to motivate you and your fellow students. SIMIODE is your chance to support this approach for students now. You can see students value this approach in our [SCUDEM 2017 video](#). Join us and contribute your support, financially and intellectually.

As a mathematics education organization we are open to receiving public support. In fact, we need this support to exist, so please contribute. You can contribute financial support for SIMIODE in whatever amount you feel appropriate at [Donate](#). See our [Mission Statement](#) for reasons why you should support SIMIODE. All contributions are tax-deductible. For ANY contribution we will send you a letter of appreciation, acknowledging your contribution, for tax purposes. Please provide your email for this letter. Thank you.

You may confirm our NonProfit status at the official listing of SIMIODE in the [IRS Organization List of NonProfit Organizations](#).

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## CONSIDER REFEREEING MATERIALS SUBMITTED TO SIMIODE.

The high quality material in SIMIODE needs scrutiny, review, and collegial suggestions for improvement. Please consider refereeing materials submitted to SIMIODE for online publication. We use a double blind, peer reviewed [manuscript management system](#) to insure high quality reviews. You can sign up as a referee to review materials and help make quality SIMIODE offerings for users at our [SIMIODE FastTrack Page](#). Thank you.

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## RECENT PUBLICATIONS OF MODELING SCENARIOS IN SIMIODE

How do students relate graphs of functions and derivatives in an SIR model is the challenging them in Meredith Greer of Bates College, Lewiston ME USA shows us how in her Modeling Scenario [Functions and Derivatives in SIR Models](#).

Mary Vanderschoot of Wheaton College, Wheaton IL USA, wrote a fascinating Modeling Scenario on data and modeling [Evictions in the United States](#).

Jue Wang of Grand Valley State University, Allendale MI USA offered several new Modeling Scenarios and we offer up her work on [Cancer Growth](#). Her abstract reads, "This scenario guides students in the use of differential equation models to predict cancer growth and optimize treatment outcomes. Several classical models for cancer growth are studied, including exponential, power law, Bertalanffy, logistic, and Gompertz. They examine the behaviors of the equations and solutions through qualitative techniques. Furthermore, students evaluate how cancer treatments affect tumor growth. Real cancer data are provided to give options for data fitting and prediction of cancer growth. Through step-by-step investigation, conjecturing, predicting, and analyzing, students discover how their knowledge can be used to address complex and real problems, and improve problem solving ability and mathematical reasoning skills."

These three Modeling Scenarios were produced in our NSF Funded Faculty Developer Workshop at Manhattan College, Riverdale NY USA in July 2018 and many more will be published. You can look for them in [What's New](#) under Resources in our Main Page Banner. Check them out.

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## WHAT ARE YOU WAITING FOR? PUBLISH IN SIMIODE

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If you are teaching differential equations of some sort you have probably written and assigned projects. Consider publishing your materials online using our peer reviewed, double blind referee system.

You can see how to submit your materials [here](#). What you do is important to your students, but it is also worthy of sharing with colleagues and their students. Step up and write up your projects for SIMIODE. You will have an online refereed publication at SIMIODE. You will be pleased to know others are using your ideas, building on your success, and enjoying what you share with your students. So, what are you waiting for? Just do it!

One purpose of SIMIODE is to offer colleagues solid, refereed teaching material on which they can base a modeling first course in differential equations. Thus publishing new ideas and activities for students is a main goal of SIMIODE.

However, it is reasonable to ask yourself, "Why should I prepare, submit, and publish in SIMIODE?" [Here](#) we give you many good reasons to publish in SIMIODE. Check them out and see that many fit you. Then join us by sending us your efforts.

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## COMMENTS HELP CREATE COMMUNITY AT SIMIODE

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For each Resource posting in SIMIODE community members have the option to post COMMENTS. This is strongly encouraged as it will build conversations which will connect colleagues, improve material, and build community. Any posted Comment will be emailed to the author of that resource and conversations can then begin.

Giving feedback, reactions, and corrections to authors is very important for the individual author and the wider SIMIODE community. If you visit and scan/read or actually use a Modeling Scenario or Technique Narratives please offer comments. You may even wish to upload a new resource which has significant added-value. If so then contact [Director@simiode.org](mailto:Director@simiode.org) to inquire how you can do this. We would welcome such efforts.

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## CALL FOR TECHNIQUE NARRATIVES FOR SIMIODE

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We publish more and more Modeling Scenarios all the time. Indeed, these are the core of support material for colleagues planning to do more modeling in support of learning differential equations.

It is also important to offer colleagues and their students what we call Technique Narrative activities. These are closer to the traditional material of solution strategies and methods offered in differential equations courses and may help faculty in a more comfortable transition to using modeling in their teaching. SIMIODE offers a small but growing list of [Technique Narratives](#). As with Modeling Scenarios, we have a Student Version in which the STATEMENT of the problem is offered with supporting materials and we have the Teacher Version in which COMMENTS are offered to assist in planning, teaching, and carrying out the modeling activity.

A good example of a Technique Narrative is found in [1-002-S-Text-IntegratingFactor](#). Here the solution method of Integrating Factor is illustrated and exercises are placed in the context of science and engineering applications so the student can see not only the technique, but the worth of using the technique in context.

All Technique Narratives are FREE, downloadable, and customizable under the most generous Creative Commons license. [Visit here](#) to see them all. The list is small, too small, so we request that you share your approaches to solution methods through writing them up for publication, just as you would a [Modeling Scenario](#). They are fully searchable by topics and area of interest to you.

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## LOOK FOR CALL FOR PAPERS ON MODELING COMPETITIONS AT JMM 2019

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SIMIODE is sponsoring a morning and afternoon AMS Special Session "Using Modeling to Motivate the Study of Differential Equations" and the [Call for Abstracts](#) for contributions extends through 25 September 2018. If you are reading this, most likely you have engaged in using some modeling activity in your differential equations course and would professionally benefit from sharing with others. Just do it!

COMAP sponsored Mathematical Contest in Modeling (MCM), Interdisciplinary Contest in Modeling (ICM), and High School Mathematical Contest in Modeling (HiMCM), and SIMIODE sponsored Student Competition Using Differential Equations Modeling (SCUDEM) are team competitions in which students apply the mathematics they know to solve a real world problem. Students routinely report learning more in this 4-day period than any other period during college, and find it one of the most rewarding experiences of their undergraduate careers. Students point to this experience in interviews as an example of working in a team environment, meeting a deadline, and as evidence of their problem-solving ability. The value of participating is worth much more than the four days of work, making this an impactful experience for faculty advisors as well.

This MAA Contributed Paper Session is aimed at faculty who wish to begin advising teams

and for current advisors to share strategies for student success. We invite presentations focused on building and supporting student teams, developing mentor relationships for faculty, and presentations elaborating the judging process in order to help advisors better prepare student teams. We especially encourage student teams who have achieved a "Meritorious" or higher rating to report on their contest experience.

You can submit your abstract [here](#) and note that the deadline for submission is 25 September 2018.

The publication of this Call for Papers will appear in MAA's *FOCUS* and *Notices of the AMS*.  
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## FREE ONLINE DIFFERENTIAL EQUATIONS TEXTS

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We offer [annotated listings of FREE online differential equations texts](#). This is one of the more popular sections when colleagues visit our site. There are over two dozen such texts. Colleagues have shared their materials in complete text form, often with traditional course structure, as well as rich sets of resources from which to teach. Most texts offered cover the basics of technique and offer exercises. Many offer modeling applications. Your students will appreciate a FREE text and you might enjoy the fresh approaches taken in such presentations. Try it!

Ideally we believe one could save students lots of money by using a FREE online text along with SIMIODE Modeling Scenarios. Make the move for your students and enjoy the excitement of using modeling to motivate learning in your differential equations course.  
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## SOURCES FOR YOUR OWN MODELING SCENARIOS

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SIMIODE offers [potential modeling scenario ideas](#). There are hundreds of these! These are materials, thoughts, pointers, summaries, articles, etc. to encourage and support your modeling scenario ideas. You must be registered and signed in to view these resources. Consider these ideas and use them to design your own modeling scenarios for your students and then publish this material in SIMIODE.

Of course, you can publish your own source materials, perhaps ideas you have not been able to get to, but want to or wish to engage with others in producing a Modeling Scenario. Just upload them for all to see. Use the "Start a new Potential Scenario Idea" button and contribute.

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## SEVERAL WORTHWHILE PROJECT AND SOURCE EFFORTS TO CONSIDER

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[Inquiry-Oriented Differential Equations \(IODE\)](#) offers a first course in differential equations focused on understanding of the big ideas in first order, second order, nonlinear, and systems of differential equations. The course is designed as a full semester course and topics covered include solving ODEs; numerical, analytic and graphical solution methods; solutions and spaces of solutions; linear systems; linearization; qualitative analysis of both ODEs and linear systems of ODEs; structures of solution spaces. The term inquiry includes the following three principles: deep engagement in mathematics, peer-to-peer interaction, instructor interest in and use of student thinking. At this site you will find student materials, teacher materials, links to tools/technology, relevant projects, and publications, as well as, contact information for the IODE Team.

The [CODEE Journal](#) is a peer-reviewed, open-access publication, distributed by the CODEE (Community of Ordinary Differential Equations Educators) and published by the Claremont Colleges Library, for original materials that promote the teaching and learning of ordinary differential equations.

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The [Consortium for Mathematics and Its Applications \(COMAP\)](#) is a source for all levels grade school high school, and higher education of modeling materials - books, modules, videos, and several [international modeling competitions](#) for high school and undergraduate students.

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## WORDS FROM THE DIRECTOR

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SIMIODE is a community which is alive, vibrant, and rich in resources and individual talents to assist colleagues who wish to teach differential equations using modeling to motivate students.

There are a number of ways you can add to the community:

**Contribute materials** -- You can learn more about this at our [Author Information](#) section and get even more details once you have signed into SIMIODE. There you will find types of materials and instructions on how to contribute and begin the process leading to publication in SIMIODE.

**Register to referee and review submitted materials.** -- Good scholarship merits attention and our double-blind, peer-referee system affords quality reviews of submitted materials. Please, visit our [Manuscript Management system](#) and register as a referee.

**Post slides from your presentations or talks.** -- When you give a talk you can post your slides, details of the talk or meeting, and comments at [Resources: Presentations](#). Now that you have spread the word beyond the SIMIODE community bring it back home for your fellow SIMIODE members to see.

**Attend a MAA Contributed Paper Session at MathFest or an AMS Special Session at JMM** devoted to modeling in differential equations course work and see what others are doing. Step up after the talk and engage the speaker. You will have a new collegial friend!

**When you attend a talk** -- on an application of differential equations encourage the presenter to consider sharing these ideas with the SIMIODE community. Encouragement helps young faculty expand their reach.

As always please let us hear from you with your concerns, your news, and your activities. Contact us at [Director@SIMIODE.org](mailto:Director@SIMIODE.org).

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