

Volume II Number 6

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TABLE OF CONTENTS

- SIMIODE is now a 501(c)(3) tax exempt organization - please support us
- Differential equations at JMM Atlanta GA, 4-7 January 2017
- White Paper -- Reasons for SIMIODE
- What are you waiting for? Publish in SIMIODE.
- Young authors at SIMIODE
- Publishing Your Students' Projects
- Comments Are Now in Order on Resources in SIMIODE
- Modeling Scenarios You Might Consider in Your Teaching
- Registering in SIMIODE
- SIMIODE Minicourse at JMM 2017 - Atlanta GA USA
- FREE Online Differential Equations Texts
- SIMIODE Channel at YouTube
- Sources for Your Own Modeling Scenarios
- Words of Encouragement from the Director

WELCOME TO SIMIODE AND OUR NEWSLETTER

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

[Return to Table of Contents](#)

SIMIODE IS NOW A TAX EXEMPT ORGANIZATION

SIMIODE is now a 501(c)(3) tax exempt organization and can accept tax deductible contributions from individuals, corporations, and foundations. Previous to this SIMIODE was privately funded with some much appreciated assistance from COMAP (Consortium for Mathematics and its Applications).

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](#). Thank you.

[Return to Table of Contents](#)

DIFFERENTIAL EQUATIONS AT JMM ATLANTA GA, 4-7 JANUARY 2017

This year is a great year at the Joint Mathematics Meetings for there are many sessions involving differential equations and modeling for your consideration. We list them here. Mark your program and plan to attend as many as you can.

MAA Session on The Teaching and Learning of Undergraduate Ordinary Differential Equations, I on Friday January 6, 2017, 8:00 AM-10:55 AM, A702, Atrium Level, Marriott Marquis Atlanta and organized by Christopher S. Goodrich, Creighton Preparatory School, and Beverly H. West, Cornell University. Some titles to whet your appetite:

- ODE Reviews: A Repository of Reviews of Articles Related to the Teaching and Learning of ODEs
- Engaged Learning in Large-enrollment Differential Equations through Computer Laboratory Materials
- Stay Tuned -- Modeling in Differential Equations Courses

MAA Session on The Teaching and Learning of Undergraduate Ordinary Differential Equations, II on Friday January 6, 2017, 1:00 PM-5:30 PM, A702, Atrium Level, Marriott Marquis Atlanta and organized by Christopher S. Goodrich, Creighton Preparatory School, and Beverly H. West, Cornell University. Some titles to whet your appetite:

- Wave Propagation Inspiring Techniques in Differential Equations
- What does it mean to find a solution to a system of differential equations? Hands-on and technology helps with the conceptualization
- Exploring the Solar System through Differential Equations and Vector Calculus

AMS Special Session on The Modeling First Approach to Teaching Differential Equations on Saturday January 7, 2017, 8:00 AM-12:20 PM, A601, Atrium Level, Marriott Marquis Atlanta and organized by Chris McCarthy, City University of New York and Brian

Winkel, SIMIODE. Some titles to whet your appetite:

- Baby steps for introducing Modeling First with teaching Differential Equations
- Modeling Improvisation: Taking Classroom Materials & Making Them Your Own
- Creating and using videos in support of modeling in differential equations course work
- Remodel Your Differential Equations Course.

MAA Minicourse: Teaching Modeling-First Differential Equations--Technology and Complete End Game Efforts See details in separate article.

[Return to Table of Contents](#)

WHITE PAPER -- REASONS FOR SIMIODE

You can see (and learn) a lot by just looking. Visit, read, and share our White Paper on [Reasons for SIMIODE](#). Share the news and information about our work with colleagues and friends. Let them know there are exciting options and possibilities for teaching differential equations.

[Return to Table of Contents](#)

WHAT ARE YOU WAITING FOR? PUBLISH IN SIMIODE.

If you are reading this then you probably are teaching differential equations of some sort. Moreover, you have probably written and assigned projects. Well, now is the time to publish your materials online in our peer reviewed, double blind referee system.

We quote Willie Nelson in our blog entry of 14 May 2016 [The Wisdom of Willie Nelson](#). He said, "If you can be content right now, then you'll always be content, because it's always right now." Do not just be content that you have done great things for your students. Share that good news and experience with others through publication in SIMIODE.

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

Your contribution can be as broad in scope as in [4-20-S-AnIEDBlast](#) or as focused with a modest modification of a text problem as in [1-93-S-SucroseReaction](#).

One of the main purposes 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.

[Return to Table of Contents](#)

YOUNG AUTHORS AT SIMIODE

We note modeling scenarios material contributed by young authors.

Elizabeth Carlson, while a student at Carroll College, Helena MT USA (now a graduate student in applied mathematics at the University of Nebraska-Lincoln) co-authored a wonderful simulation activity called [Fish Mixing](#) with her teacher Eric Sullivan. This activity starts, "The Department of Fish, Wildlife, and Parks has carefully estimated the number of fish taken by sport fishing each week, and they have decided to keep the fish population as constant as possible by replacing the fish lost by an equal number of Arctic Grayling and Bull Trout." A simulation using tokens or coins permits students to collect data and model mixed fish populations. This is the first publication of a Modeling Scenario by an undergraduate student. Elizabeth also assisted and led sessions at SIMIODE's MAA PREP course in Summer 2015. Congratulations Elizabeth.

Kevin S. Huang, currently a student of Robert Kennedy at Centennial High School in Ellicott, considers the dynamics of determining the minimum initial velocity to keep a [circular \(vertical\) roller coaster](#) cart on track as it loops. Kevin offers the case in which there is no friction and then challenges students to consider the case where there is friction. This is the first publication of a Modeling Scenario by a high school student, an exceptional student. Congratulations Kevin!

[Return to Table of Contents](#)

PUBLISHING YOUR STUDENTS' PROJECTS

You assign projects in your differential equations courses, often encouraging students to find project areas of interest to them. You collect them and take the time to grade them and give them feedback. As you read them there are several which really stand out. They are exceptionally well-written; they involve interesting mathematics - stuff you did not realize; they extend the mathematics you offered them in your course; and they leave you with a great feeling about your students.

Encourage and enable your students to submit these excellent projects for publication in SIMIODE.

We have a place for publishing complete student projects so others can see the work of your best and finest. Have your students submit their project to our [Manuscript Management](#) site for refereeing, editing, and acceptance. They can also submit supplemental materials, e.g., video, spreadsheet, data sets, computer algebra files, posters, PowerPoint slides, extra pdf files.

We believe quality student work is worthy of display, of sharing, and of praise. Do this for

your students. Help them publish their good work at SIMIODE.

[Return to Table of Contents](#)

COMMENTS ARE NOW IN ORDER ON RESOURCES IN SIMIODE

SIMIODE is an intensional community and that means we seek communication and support. Accordingly, we have instituted the capability to offer collegial Comments on all resources published in SIMIODE. Any posted Comment will be emailed to the author of that resource and conversations can then begin.

[Return to Table of Contents](#)

MODELING SCENARIOS YOU MIGHT CONSIDER USING IN YOUR TEACHING

We publish more and more Modeling Scenarios all the time after they have worked their way through the referee and editorial process and are now available. In this issue we feature some of the shorter scenarios.

1-13-S-SleuthingWithDifferentialEquations. Here students can dig into several small activities, "Contested speeding violation and the wheels of justice," "I throw an arrow into the air, it lands I know where," "Death of an actor," and "Elementary (My Dear Watson) Differential Equation."

1-2-S-Tossing. Results of a simulation in which at each generation 10-sided die are cast and those with a 1, say, facing up die can be modeled.

1-16-S-DogDrugs. This one is so small we offer it here in its entirety, sans data and graph. This is an exercise from an iconic text, Riggs, D. S. 1963. *The Mathematical Approach to Physiological Problems*. Cambridge MA: The M.I.T.Press. (p. 166, Exercise 6). In the dog, an intravenous dose of 30 mg of pentobarbital sodium per kilogram of body weight will usually produce surgical anesthesia. Also in the dog, pentobarbital has a biological half-life of about 4.5 hours, due almost entirely to metabolism. You anesthetize a 14-kg dog with the above dose of pentobarbital. Two hours later the anesthesia is obviously beginning to lighten and you want to restore the original depth of anesthesia. How many milligrams of pentobarbital sodium should you inject?

And lest you think we do not have depth(!) we point to a lab oriented Modeling Scenario **1-110-S-SnailsInaTidePool** authored by Lisa Driskell and Audrey Malagon who have been involved with SIMIODE since its inception. This activity involves monitoring the temperature of mollusks in a tidal pool and uses Newton's Law of cooling/warming.

[Return to Table of Contents](#)

REGISTERING IN SIMIODE

If you have not registered in SIMIODE please go to our [Home Page](#) and do so to benefit from the rich resources in the SIMIODE community.

[Return to Table of Contents](#)

SIMIODE MINICOURSE AT JMM 2017 IN ATLANTA GA USA

The title of the minicourse is, "Teaching Modeling-First Differential Equations - Technology and Complete End Game Efforts." The team leading this effort will be Rosemary Farley, Manhattan College; Therese Shelton, Southwestern College; Patrice Tiffany, Manhattan College; Jon Paynter, US Military Academy; and Brian Winkel, SIMIODE.

We will offer experiences for building and teaching mathematical models with differential equations: epidemic model of school infirmary, Torricelli's Law, fishery management effort, post-operative retinal fluid dissipation, fair stadium design, sublimation of carbon dioxide, chemical kinetics, ant tunnel building, spread of oil slick, pursuit efforts, pharmacokinetics of LSD and paracetamol, shuttlecock fall, and lake algae. We will discuss the role technology plays in the end game modeling efforts of parameter estimation, non-linear regression analysis, and model comparison. Through hands-on small group learning, faculty will experience the use of modeling and technology to teach differential equations. We, of course, plan to use SIMIODE - Systemic Initiative for Modeling Investigations and Opportunities with Differential Equations, an online (www.simiode.org) community of teachers.

Sign up when you [Register for the Joint Mathematics Meetings](#). The minicourse consists of two hands-on, active sessions, each two hours in length. Part A - Thursday, 5 January 2017, 1:00 - 3:00 PM and Part B - Saturday, 7 January 2017, 1:00 - 3:00 PM.

[Return to Table of Contents](#)

FREE ONLINE DIFFERENTIAL EQUATIONS TEXTS

We offer annotated listings of **FREE** online differential equations texts. 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. At least look at what is available.

[Return to Table of Contents](#)

SIMIODE CHANNEL AT YOUTUBE

SIMIODE has a channel at YouTube [SIMIODE YouTube Channel](#). In addition to an [introductory overview](#), a video of what SIMIODE is and can be, there are several videos related to Torricelli's law in which students can collect their own data from a real physical event, model the phenomenon, estimate parameters, and confirm their analysis with comparisons of plots of final model and data. One video is for a right circular column of

water in which the water is draining from the cylinder while a digital clock offers time to the thousandth of a second in the background and the height can be seen to the nearest millimeter. Here is an example at [Falling Column of Water in Cylinder](#). Another is of right circular cone of water in which the water is [draining from the cone](#) while a digital clock offers time to the thousandth of a second in the background and the height can be seen to the nearest millimeter.

We just recently posted an [animation of condensation](#) in which viewers can collect data from a simulation video of particles moving about a boxed region and condensing on one side of the box. This is used in a modeling activity to confirm the model and to estimate parameters of the model.

[Return to Table of Contents](#)

SOURCES FOR YOUR OWN MODELING SCENARIOS

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

[Return to Table of Contents](#)

WORDS OF ENCOURAGEMENT FROM THE DIRECTOR

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 do this at [Resources: New](#). 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 locally or beyond 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.

As always please let us hear from you with your concerns, your news, and your activities. Contact us at Director@simiode.org.

[Return to Table of Contents](#)

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