CONTENTS

COLLEGE ON SIMULATION AND GAMING
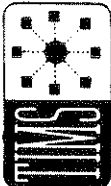**THE INSTITUTE OF MANAGEMENT SCIENCES**
290 WESTMINSTER STREET
PROVIDENCE, RI 02903

FIRST CLASS

TIMS COLLEGE ON SIMULATION OFFICERS

Chairman
Lee Schruben
School of Operations Research
Cornell University
Ithaca, NY 14853
fx9j@cornella.bitnet

Secretary-Treasurer
W. David Kelton
Department of Management Sciences
University of Minnesota
Minneapolis, MN 55455
dkelton@umnacvx.bitnet

Vice-Chairman/Chairman-Elect
James R. Wilson
School of Industrial Engineering
Purdue University
West Lafayette, IN 47907
wilsonj@gb.ecn.purdue.edu

Newsletter **Editor**
Barry L. Nelson
Dept. of Industrial & Systems Engineering
The Ohio State University
Columbus, OH 43210
ts3816@ohstvma.bitnet

Assistant *Newsletter* **Editor**
David Goldsman
School of Industrial & Systems Engineering
Georgia Institute of Technology
Atlanta, GA 30332
dgoldsma@gtri01.bitnet

BALLOT FOR NEW OFFICERS

To vote for officers of the college, return the ballot below to Lee Schruben, School of Operations Research, Cornell University, Ithaca, NY 14853. Ballots must be received by or before April 23, 1988. Only members of the college are eligible to vote. The mailing label on the back of the ballot with your membership number certifies your vote; however, your vote will be kept confidential.

Vote for at most one candidate for each office. As specified in the college bylaws, candidates names are listed in alphabetical order, and a space is provided for write-in candidates. Officers serve a two-year term, and the vice-chairman/chairman-elect becomes the chairman of the college for the next term. *Newsletter* editors are appointed by the chairman. James R. Wilson of Purdue University is the new chairman of the college.

. . . .

Vice-Chairman/Chairman-Elect

____ Gordon M. Clark

____ W. David Kelton

_____

Secretary-Treasurer

____ Barry L. Nelson

____ David Withers

_____

CHAIRMAN'S MESSAGE

In my last message as chairman of TIMS/CS it is appropriate to thank the many people who have lent a helping hand while I was chairing the college. When thanking specific people there is always the risk of oversight. Rather than safely extending a generalized thank you, I will accept that risk and hope the people I forget will forgive me.

As vice-chairman, Jim Wilson has arranged some excellent sessions at national meetings. The shifting of emphasis from the fall ORSA/TIMS meeting to the spring TIMS/ORSA meeting has been well received. Thanks go as well to the many chairpersons and speakers at these college-sponsored sessions. David Kelton, our secretary-treasurer, has overseen the continued increase in college funds and faithfully reported minutes at some very long and admittedly disorganized meetings. The service to the college by Jim and David is even more noteworthy in light of the fact that they also played key roles in Winter Simulation Conferences as proceedings editor and program chairman.

Persons who served on awards and bylaws committees include Bill Biles, Gordon Clark, Averill Law, Steve Roberts, Bruce Schmeiser, Bill Schmidt, Robert Sargent, Arne Thesen, Voratas Kachitvichyanukul, and David Withers. The college gave its first awards for outstanding service and published research, and adopted bylaws as well as established a student presentation prize. Each of these activities required the work of a dedicated committee.

David Goldsman arranged a Ph.D. student colloquium before the last Winter Simulation Conference. He gave the college credit as a sponsor for this very successful session. It is our intention to continue this activity.

A very special appreciation is acknowledged for Alan Pritsker who has been our representative for many years on the Board of Directors of the Winter Simulation Conference. After serving as a pro tem representative at just one WSC Board Meeting I can assure you that this is not an easy job. Steve Roberts has agreed to take over as our WSC board representative.

Finally, I want to thank the person who has probably worked harder than anyone for the college these past few years, our *Newsletter* editor, Barry Nelson (*not true, but thanks Lee—Ed.*) Barry has agreed to help our new *Newsletter* editor, Bruce Schmeiser, learn how to edit a major publication.

In the past TIMS/CS Chairman's Messages, I have followed themes of pride in our profession, respect for our colleagues, and appreciation of service. In my final message I would like to add one more theme: fun. Building simulation models and studying their behavior is fun, research formulating and investigating simulation problems is fun, and service as TIMS/CS Chairman has been fun. Thank you all and good luck Jim.

Lee Schruben
Chairman, TIMS College on Simulation

TREASURER'S REPORT

For the period 8/29/87 through 1/8/88 the college account had the following transactions, all at First Minnesota, Edina:

Balance Forward: $17,383.70

Revenues:
Interest earned	290.73	
Sale of WSC '86 Proceedings	160.00	
Total Revenues		450.95

Disbursements:
Fall '87 *Newsletter*	375.98	
Books for Best Publication Award	341.40	
Reception at St. Louis ORSA/TIMS	19.55	
Plaque for Service Award	69.55	
Total Disbursements		806.48

Net (revenues - disbursements)   (as of 1/8/88)   -355.55

Balance Forward (Previous Balance + Net)   17,028.15

All funds are in a "Supernow" money market checking account at First Minnesota, since the rates on certificates are currently very low. In addition to these funds, the college has on account at TIMS Headquarters the sum of $80.89, bringing the net worth of the college to $17,109.04. The return of the $2000.00 advance to the 1987 Winter Simulation Conference, plus the college's share (1/7th) of the surplus from the Conference, should be received during the coming spring. However, there will be another $2000.00 advance requested for the 1988 Winter Simulation Conference shortly.

Respectfully submitted,
W. David Kelton, Secretary/Treasurer
January 8, 1988

MINUTES OF THE COLLEGE MEETING AT ST. LOUIS ORSA/TIMS

Attending: Jorge Haddock, Jim Swain, Dave Goldsman, Keebom Kang, Arne Thesen, Michael Ketcham, Sekhar Venkatraman, Jeffrey Tew, Voratas Kachitvichyanukul, Golgen Bengu, David Withers, Jerald Ault, Sanjay Jain, Chuck White, Bruce Schmeiser, Jim Wilson, and Lee Schruben.

College chairman Schruben called the meeting to order.

Chairman Schruben reminded each of the members present to vote on the proposed bylaws for the college by sending in the ballot included in the Fall 1987 *Newsletter* not later than November 1, 1987.

Chairman Schruben called for nominations for college officers.

There was some discussion of offering the *Proceedings of the 1987 Winter Simulation Conference* for sale to students at cost. Jim Wilson pointed out that in 1986, the college ordered 30 copies of the 1986 *Proceedings*, and only 15 copies were sold to students, with the balance sold to SCS. Arne Thesen moved to repeat this offer in 1987. The motion was defeated.

3

Voratas Kachitvichyanukul moved to establish a student paper award. David Withers suggested that such an award should be used to encourage high quality presentations at TIMS/ORSA Meetings, and thus the college should consider establishing an award for the best student presentation at a Joint National TIMS/ORSA meeting. Arne Thesen suggested that the college appoint a committee to formalize the details of how such an award would be administered, and he proposed (a) that the committee should consist of one member from academia and one member from industry, and (b) that the prize should include a monetary award of up to $1000. The original motion by Voratas Kachitvichyanukul passed. Chairman Schruben appointed a committee consisting of Voratas Kachitvichyanukul and David Withers to write a proposal for presentation at the college business meeting held in conjunction with the 1987 Winter Simulation Conference.

Vice-chairman Jim Wilson reported that the college is sponsoring nine sessions on simulation at the Spring 1988 Joint National TIMS/ORSA Meeting in Washington, D.C.

Chairman Schruben adjourned the meeting.

Respectfully submitted,
James R. Wilson
(for W. David Kelton)

MINUTES OF THE COLLEGE MEETING AT ATLANTA WSC '87

Attending: David Briskman (Cornell), Jorge Haddock (RPI), Jim Swain (Georgia Tech), Voratas Kachitvichyanukul (U. of Iowa), Paul Sanchez (U. of Arizona), Arnold Buss (Washington U.), George Fishman (U. of North Carolina), Andy Seila (U. of Georgia), Pandu Tadikamalla (U. of Pittsburgh), Sekhar Venkatraman (Purdue), Mary Johnson (Purdue), Mike Taaffe (Purdue), Alan Pritsker (Pritsker & Associates), Arne Thesen (U. of Wisconsin), Mike Overstreet (Old Dominion U.), Bob O'Keefe (RPI), Tina Song (Purdue), Golgen Bengu (U. of Houston), Bruce Schmeiser (Purdue), Sheldon Jacobson (Cornell), Russell Barton (Cornell), Dick Nance (Virginia Tech), Hossein Safizadeh (Wichita State), Gordon Clark (Ohio State), Steve Roberts (Regenstrief Institute), Barry Nelson (Ohio State), Robert Sargent (Syracuse), Marc Meketon (Bell Labs), Phil Cobbin (Sierra Simulations & Software), Jim Wilson (Purdue), David Kelton (U. of Minnesota).

Chairman Schruben called the meeting to order at 6:30 P.M. on December 12, 1987.

Bruce Schmeiser, incoming Chair of the WSC Board, wished to thank Alan Pritsker for his six years of service as the college's representative to the WSC Board. He also wished to welcome Steve Roberts as the new representative.

Lee Schruben announced that the proposed new college bylaws had been adopted by the membership.

Lee Schruben announced the slate of candidates for the election of the college officers: Gordon Clark versus David Kelton for vice-chairman/chairman-elect, and Barry Nelson versus Dave Withers for secretary/treasurer. The new chairman will automatically be Jim Wilson, the current vice-chairman/chairman-elect.

David Kelton, secretary/treasurer, gave a brief oral report of the college treasury, reporting that the level is about $17,000.

Lee Schruben announced that it is now possible to join the college without joining TIMS for a fee of $3.00 (as opposed to the $2.00 fee for TIMS members).

Arne Thesen, WSC '87 Proceedings Editor, noted that even though the college did not ask for WSC '87 Proceedings to sell to students as was done for WSC '86, there was a surplus of some 39 copies that were going to IEEE, and that it might be possible to retrieve them from IEEE if the college desired to sell them to students again. He noted that most of the WSC '86 Proceedings the college had available were in fact sold.

Barry Nelson, *Newsletter* editor, asked for members' electronic mail addresses, and for permission to publish them in the college *Newsletter*.

Dave Withers and Voratas Kachitvichyanukul gave a presentation of their proposal for the procedures and policies for the Best Student Presentation Award. Dave Withers moved to accept the proposal, and Voratas Kachitvichyanukul seconded. The proposal was then presented in detail, a lengthy and involved discussion ensued, and several changes to the proposal were suggested and written in. It was moved to accept the proposal as amended, seconded, and passed unanimously. The text of the final document is to appear in the spring 1988 edition of the college *Newsletter*. Finally, Lee Schruben thanked Dave and Voratas for their considerable efforts in drafting and presenting the proposal.

The meeting was adjourned at about 8:15 P.M.

Respectfully submitted,
W. David Kelton, Secretary/Treasurer

Corrections to the minutes of college meeting at New Orleans TIMS/ORSA Conference: The report on new committee members should state that Bill Schmidt replaces Steve Roberts on the Outstanding Simulation Publication Award Committee, and Robert Sargent replaces Bruce Schmeiser on the Outstanding Service Award Committee. These minutes appeared in Vol. 11, No. 2 (1987) of the *Newsletter*.

NEW BOOKS

M.E. Johnson (1987), *Multivariate Statistical Simulation*, Wiley, N.Y.

Contents: Introduction; Univariate Distributions and their Generation; Multivariate Generation Techniques; Multivariate Normal and Related Distributions; Johnson's Translation System; Elliptically Contoured Distributions; Circular, Spherical, and Related Distributions; Khintchine Distributions; Multivariate Burr, Pareto, and Logistic Distributions; Miscellaneous Distributions; Research Directions.

ABSTRACTS OF PAPERS

Bennett L. Fox (1987), "Complexity of Gradient Estimation for Transient Markov Chains," Technical Report No. 753, School of Operations Research and Industrial Engineering, Cornell University.

The setting is finite-horizon, continuous-time Markov chains. We find the computational complexity of a simulation scheme to estimate expected terminal reward or expected cumulative reward and their gradients with respect to a vector parameter. This requires adapting results from the asymptotic theory of extreme order statistics. We compare the complexities for the simulation scheme with those of two deterministic numerical methods.

"Computing the Gradient of Expected Reward Up To Absorption," Technical Report No. 755, School of Operations Research and Industrial Engineering, Cornell University.

We compute the gradient of the expected cumulative reward until absorption for a (uniformized) continuous-time Markov chain. Three methods are compared: direct elimination, successive approximations, and simulation. Our criterion is the order of magnitude of the computational effort to satisfy a given error tolerance.

Robert G. Sargent, Keebom Kang, and David Goldsman (1987), "An Investigation of Small Sample Size Behavior of Confidence Interval Estimation Procedures," Working Paper #87-005, Dept. of Industrial Engineering and Operations Research, Syracuse University.

We investigate the small sample size behavior of different confidence interval estimators (c.i.e.'s) for the mean of the output process from a stationary discrete-event simulation. C.i.e.'s arising from the methods of nonoverlapping batched means, overlapping batched means, and standardized time series are studied. Although a number of analytic results are presented, the primary method of investigation involves large-scale Monte Carlo experimentation. For a specific c.i.e., the performance measures of interest include the achieved coverage probability, and the expected value and variance of the half-length of the c.i.e. Detailed comparisons and conclusions are made regarding the behavior of the c.i.e.'s for a variety of stochastic processes.

Jeffery D. Tew and James R. Wilson (1987), "Metamodel Estimation Using Integrated Correlation Methods," Tech Report VTR 8703, Department of Industrial Engineering and Operations Research, Virginia Polytechnic Institute and State University.

This paper develops a generalized approach for combining the use of the Schruben-Margolin correlation induction strategy and control variates in a simulation experiment designed to estimte a metamodel that is linear in the unknown parameters relating the response variable of interest to selected exogenous decision variables. This generalized approach is based on standard techniques of regression analysis. Under certain broad assumptions, the combined use of the Schruben-Margolin correlation induction strategy and control variates is shown to give a more efficient estimator of the metamodel coefficients than each of the following conventional correlation-based variance reduction techniques: independent streams, common random numbers, control variates, and the Schruben-Margolin strategy.

Jason C. Hsu and Barry L. Nelson (1987), "Control Variates for Quantile Estimation," Working Paper Series No. 1987-013, Dept. of Industrial and Systems Engineering, The Ohio State University.

New point and interval estimators for quantiles that employ a control variate are introduced. The properties of these estimators do not depend on the usual assumption of joint normality between the random variable of interest and the control. Empirical results are presented.

Barry L. Nelson (1987), "Variance Reduction in the Presence of Initial-Condition Bias," Working Paper Series No. 1987-011, Dept. of Industrial and Systems Engineering, The Ohio State University.

We consider the application of antithetic variates and control variates variance reduction techniques (VRTs) in the context of steady-state simulation experiments when initial-condition bias is present. We show that, by appropriately modifying the experiment design, incorporating a VRT can improve both point and interval-estimator performance.

TIMS COLLEGE ON SIMULATION
BEST STUDENT RESEARCH PRESENTATION AWARD

Beginning with the Spring 1988 TIMS/ORSA Joint National Meetings in Washington, D.C., the College on Simulation will present an award annually for the best student research presentation at the spring meeting. Details of the procedure follow:

A. **Objective:** To encourage the development of good presentation skills for students' original research in the field of simulation.

B. **Award:** $500, to be split among winner(s), and a plaque. Judges may award honorable mention plaques at their disgression.

C. **Scope:**
   1. The topic must be "simulation" as per the college bylaws.
   2. Must be a scheduled presentation at the Spring TIMS/ORSA Joint National Meeting (either invited or contributed).
   3. Presenter must be a full-time student who has not yet attained the Ph.D. degree at the time of submission of the paper.
   4. There may be co-authors.
   5. In the case of co-authors, the presenter must be equal or greatest contributor to the work.
   6. May be work in progress, if so labeled.
   7. The content of the presentation cannot include any major technical flaws.
   8. A presenter may win a monetary award at most once.

D. **Metrics:** The attributes below will be scored on a scale of from 0 to 5, then multiplied by the weights shown.
   1. Quality of presentation, including clarity, vocabulary, communication with the audience, and complete coverage of the topic, including background and motivation, prior work or credits, originality, identification of "new news," rationale or proofs or arguments, and conclusions or recommendations or plans. (weight 3).
   2. Quality of presentation material, including clarity, format, legibility, neatness and completeness (weight 3).
   3. Appropriateness of technical detail to the audience (weight 1).
   4. Responses to questions (weight 1).
   5. Length of presentation versus allotted time (weight 1).
   6. Effective use of other materials, including samples and computer demonstrations (weight 1).

E. **Logistics:**
   1. The college chairman appoints a 3 member judging committee, including a senior judge, for each spring meeting. The chairman will attempt to achieve a balance between academic, industry, and government judges, have no student-teacher conflicts, and minimize institutional bias. Appointments will be tentative until all presenters are known.

2. Faculty advisors for student presenters must notify the college secretary in writing at least 45 days prior to the spring meeting; the nomination should include the presenter's name, mailing address, title of presentation, and session name (if known).

3. The college secretary will mail a blank judging form and guide to effective presentations to each presenter. The college secretary will mail a list of presenters, titles and sessions, and blank judging sheets to all judges.

4. Comments: Presentation scheduling will be as per the normal meeting process. The paper need not be in a college-sponsored session.

F. **Judging:**

1. Each judge listens to each presentation and completes a form. If a scheduling conflict among presenters occurs, each judge chooses a surrogate, with the approval of the chairman, to cover the conflicting presentation(s).

2. Each metric is scored 0 to 5.

3. Judges are encouraged to add comments to the forms.

4. Highest total weighted score wins (150 points possible).

5. All presenters with scores within 5 points (3%) of the top score tie.

6. Disqualification occurs if 2 or more judges agree on a major technical flaw.

7. Disqualification occurs if 2 or more judges agree the topic is not simulation.

8. The senior judge mails completed forms to the college chairman.

9. If for any reason a judge cannot fulfill his commitment, they are responsible for finding a replacement judge, subject to approval of the chairman.

G. **Administration:** The college chairman orders plaque(s) and authorizes check(s), mails judging forms to the presenters, and mails check(s) and plaque(s) to the faculty advisor of the winner(s). The college chairman also notifies the *Newsletter* editor and *OR/MS Today* about the award winners. All of this occurs within 30 days of the spring TIMS/ORSA meeting. Evaluations and comments are confidential, meaning that only the judges, the college chairman, and individual presenter see them.

EVENT CALENDAR

Twenty-First Annual Simulation Symposium, March 16-18, 1988, Bay Harbor Inn, Tampa, Florida. Contact Tom Kubiak, EDS Decision Technologies Division, 803 West Big Beaver Road, Troy, MI 48007, (313) 244-2763.

1988 Eastern Simulation Conferences, April 18-21, 1988, Sheraton World Hotel, Orlando, Florida. Contact SCS International, P.O. Box 17900, San Diego, CA 92117, (619) 277-3888.

Interface '88, April 21-23, 1988, Sheraton International Conference Center, Reston, Virginia. The conference theme is "Computationally Intensive Methods in Statistics." Contact Prof. Edward J. Wegman, P.O. Box 7460, Fairfax Station, VA 22039, (703) 323-2723, ewegman@gmuvax.bitnet.

TIMS/ORSA Joint National Meeting, April 25-27, 1988, Washington Hilton, Washington, D.C. General Chairman: Prof. Saul I. Gass, College of Business and Management, University of Maryland, College Park, MD 20742. The College on Simulation will sponsor sessions on the following topics: Variance Reduction for Simulation, Output Analysis, Simulation of Medical Decisions, Monte Carlo Distribution Sampling Methods, Simulation Response Surface Modeling, Simulation Modeling, Artificial Intelligence and Simulation, Ranking and Selection in Simulation, and Monte Carlo Simulation Techniques. In addition, the college will sponsor its first *Student Research Presentation Award.*

Special Interest Conference on Analysis and Control of Large Scale Stochastic Systems, May 23-25, 1988, Carolina Inn, Chapel Hill, North Carolina. Chairpersons: Vidyadhar Kulkarni and Shaler Stidham, Jr., Department of Operations Research, CB3180 Smith Building, University of North Carolina, Chapel Hill, NC 27599, (919) 962-6997.

1988 Summer Computer Simulation Conference, July 25-28, 1988. Seattle Sheraton Hotel & Towers, Seattle, Washington. Contact SCS International, P.O. Box 17900, San Diego, CA 92117, (619) 277-3888.

Southeastern Simulation Conference, October 17-19, 1988, Orlando, Florida. Contact Joseph Gauthier, 919B Willowbrook Drive, Huntsville, AL 35802, (205) 881-0947. SESC '88 will sponsor the Harvey Echenrode Memorial ADI Student Paper Contest. The winner receives a $500 award. Entries are due by June 1, 1988 to Dr. Neal Bengtson, Department of Computer Science, Box 8206, North Carolina State University, Raleigh, NC 27695.

ANNOUNCEMENTS

Joining the College on Simulation: It is now possible to be a member of the TIMS College on Simulation without being a member of TIMS. Annual membership dues for non-TIMS members of the college are $3, compared to $2 for TIMS members. To join, send name, address, e-mail address (if applicable), and $3 to James R. Wilson, School of Industrial Engineering, Purdue University, West Lafayette, IN 47907. Make checks payable to "TIMS College on Simulation." If you know people who might be interested in joining, please pass along this announcement.

Call for Papers: *1988 Winter Simulation Conference*, December 12-14, 1988, The Intercontinental Hotel, San Diego, CA. Proposals to organize sessions, present state-of-the-art reviews, or to present tutorials are due by April 1, 1988. Contributed papers (four copies) are due by May 1, 1988. Send all correspondence to John C. Comfort, School of Computer Science, Florida International University, Miami, FL 33199. Phone: (305) 554-2015. E-mail: comfort@servax.bitnet.

Call for Participation: *Third AI & Simulation Workshop*, August 22, 1988, Radisson St. Paul Hotel, Minneapolis, MN. Abstracts must be received by April 1, 1988. Contact Paul Fishwick, Dept. of Computer and Information Science, University of Florida, Gainesville, FL 32611.

Simulation Digest: Paul A. Fishwick of the University of Florida is starting an electronic mailing list on the topic of simulation. All topics connected with simulation are welcome. Topical mail messages should be sent to simulation@ufl.edu. Administrative notes, such as requests to subscribe, should be sent to simulation-request@ufl.edu.

EDITOR'S CORNER

Below is an update of the college directory of electronic-mail addresses. If you would like your address to be included, please send it to one of the *Newsletter* editors.

Name	Affiliation	e-mail address
Tom Clark	Florida State University	tclark@fsu.bitnet
Paul A. Fishwick	University of Florida	fishwick@fish.cis.ufl.edu
David Goldsman	Georgia Tech	dgoldsma@gtri01.bitnet
Jorge Haddock	RPI	ffye@rpitsmts.bitnet
V. Kachitvichyanukul	University of Iowa	aegvorwy@uiamvs.bitnet
David Kelton	University of Minnesota	dkelton@umnacvx.bitnet
Barry L. Nelson	Ohio State University	ts3816@ohstvma.bitnet nelsonb@osupyr.uucp
Steve Roberts	Purdue University	steverob.gb.ecn.purdue.edu
Bruce Schmeiser	Purdue University	schmeise@gb.ecn.purdue.edu
Lee Schruben	Cornell University	fx9j@cornella.bitnet
James R. Wilson	Purdue University	wilsonj@gb.ecn.purdue.edu
Jeff Wright	Purdue University	wrightje@simplex.ecn.purdue.edu inhp4!pur-ee!wrightje.bitnet

Thanks to all those who have contributed to the *Newsletter* during my term as editor. While it takes a little time to send an item to the editor, the reward is a more informative *Newsletter*. For those who have never contributed or have not contributed recently, keep it in mind—BLN.