

CURRICULUM VITAE

Philip Beaver, Ph.D.
Colonel (Retired) United States Army
Clinical Professor
Associate Professor of Applied Mathematics
Professional Operations Research and Business Analyst

Personal Information

Professor Philip Beaver
Daniels College of Business
DCB 585
2101 S. University Blvd
Denver, Colorado 80208
303-871-4989
pbeaver@du.edu

Academic Degrees

- Doctor of Philosophy, Applied Mathematics, (Minor in Operations Research), Naval Postgraduate School, Monterey, CA, 1998.
- Master of Science, National Resourcing Strategy, (Financial Management Industry Study), Industrial College of the Armed Forces, National Defense University, Fort McNair, Washington, D.C., 2005.
- Master of Science, Applied Mathematics, Naval Postgraduate School, Monterey, CA, 1991.
- Bachelor of Science, United States Military Academy, West Point, NY, 1983.

Academic Experience

- Clinical Professor, Department of Business Information Analytics, Daniels College of Business, University of Denver, Denver, Colorado, Fall 2015-Present
- Professor-in-Residence, Department of Business Information Analytics, Daniels College of Business, University of Denver, Denver, Colorado, Fall 2011-Summer 2014
- Adjunct Lecturer, Department of Business Information Analytics, Daniels College of Business, University of Denver, Denver, Colorado, Fall 2010-Spring 2011
- Associate Professor, Department of Mathematical Sciences, United States Military Academy, West Point, New York, 2001.
- Assistant Professor, Department of Mathematical Sciences, United States Military Academy, West Point, New York, 1992-1994, 1998-2001.
- Instructor, Department of Mathematical Sciences, United States Military Academy, West Point, New York, 1991-1992.

University of Denver, Daniels College of Business Teaching Experience

STAT 1300, Statistics I	INFO 1010, Business Information and Analysis
STAT 1400, Statistics II	INFO 1020, Business Information and Statistics
STAT 4610, Business Statistics	INFO 2020, Business Modeling and Analytics
INFO 4200, Capstone Planning	EMBA Seminars and Executive Education Courses

United States Military Academy Teaching Experience

AY92-1	MA103, Discrete Dynamical Systems
AY92-2	MA104, Single Variable Calculus
AY93-1	MA205, Multivariable Calculus
AY93-2	MA206, Probability and Statistics
	MA385, Chaos and Fractals (Course Developer and Course Director)
AY94-1	MA205, Multivariable Calculus
AY94-2	MA206, Probability and Statistics
	MA385, Chaos and Fractals (Course Director)
	MA489, Advanced Topics in Nonlinear Dynamics (Course Dev and Director)
	MA491, Research Seminar in Applied Mathematics (Cadet Advisor X2)
AY99-1	MA103, Discrete Dynamical Systems and Introduction to Calculus
AY99-2	MA364, Engineering Mathematics
	MA385, Chaos and Fractals (Course Director)
	MA491, Research Seminar in Applied Mathematics (Course Director)
AY00-1	MA371, Linear Algebra (Course Director)
	MA491, Research Seminar in Applied Mathematics (Course Director)
	SS491, Research Seminar in International Relations (Cadet Co-Advisor)
AY00-2	MA387, Mathematical Analysis I (Course Director)
	MA491, Research Seminar in Applied Mathematics (Course Director)
	MA491, Research Seminar in Applied Mathematics (Cadet Advisor)
	SS491, Research Seminar in International Relations (Cadet Co-Advisor)
AY01-1	MA487, Mathematical Analysis II (Course Director)
	MA492D, Introduction to Graph Theory (Course Director)
	MA489, Advanced Topics in Mathematical Modeling and Programming (Course Developer and Course Director)
	MA491, Research Seminar in Applied Mathematics (Course Director)
AY01-2	MA485, Complex Variable Theory (Course Director)
	MA493D, Topology (Course Developer and Course Director)
	MA491, Research Seminar in Applied Mathematics (Course Director)
	MA491, Research Seminar in Applied Mathematics (Cadet Advisor X3)

Naval Postgraduate School Teaching Experience

AY96-4	MA4321, Stability, Bifurcations, and Chaos (Volunteer Teaching Assistant)
AY97-1	MA3610, Introduction to General Topology (Taught as a reading course)
AY97-2	MA0810, Thesis Research (Student Advisor)
AY97-3	MA0810, Thesis Research (Student Advisor)

Advising Experience

United States Military Academy

- AY94-2 “Investigation of Quasi-Chaotic Behavior in the Helmholtz Equations for Arbitrarily Large Frequencies.” MA491 Capstone Project Advisor for Cadet David Orton.
- AY94-2 “Object Identification in Greyscale Imagery Using Fractal Dimension.” MA491 Capstone Project Advisor for Cadet Stephanie Quirk.
- AY00 “Hegemony, Chaos, and Complexity.” SS491 Capstone Project Co-Advisor (with Professor J. Parker) for Cadet Briana Simpson (Department of Social Sciences).
- AY00-2 “Square Matrices Similar to Essentially Nonnegative Matrices.” St. Cyr Academie Foreign Cadet Research Exchange for SLTs Geoffroy Desgress du Lou and Christophe Charlet.
- AY00-2 “A Mathematical Model of a Complex Adaptive System.” MA491 Capstone Project Advisor for Cadet Mary Oliastro.
- AY01-2 “Flatland and Beyond.” MA491 Capstone Project Advisor for Cadet Aaron Martin.
- AY01-2 “Complex Adaptive Systems and Network Routing.” MA 491 Capstone Project Advisor for Cadet John Horton.
- AY01-2 “The Hahn-Banach Theorem and the Axiom of Choice.” MA491 Capstone Project Advisor for Cadet Barret Rhoden.

Naval Postgraduate School

- AY97 “Prediction and Geometry of Chaotic Time Series.” Master’s Thesis Co-Advisor (with Professor C. Frenzen) for Captain Mary L. Leonardi, USMC.

University of Denver

- AY14 Dissertation Committee, Seif Azgandi, “Regression analysis in Software Engineering.” Anneliese Andrews Advisor, Department of Computer Science
- AY14-15 Dissertation Committee, Joe Lucente, Anneliese Andrews Advisor, Department of Computer Science

Curriculum Development, United States Military Academy

Created the course MA385, Chaos and Fractals, based on student demand in AY93. Wrote the original text for the course (Fractals and Chaos) as a directed Master's Thesis, which has been used as a text in at least three departments at other institutions. Developed the syllabus, all exercises, problem sets, and projects. The course was taught in this format until AY97, when a new text was adopted.

Created the course MA489, Advanced Topics in Nonlinear Dynamics, in AY94.

Created the course MA489, Advanced Topics in Mathematical Modeling and Programming, based on student demand in AY01.

As the course director for MA371 (Linear Algebra), MA387 (Mathematical Analysis I), MA485 (Complex Variable Theory) and MA492D (Introduction to Graph Theory), all of which were frequently-taught courses, re-wrote the syllabi based on previous course-end reports, and entered course-end reports into the Department's continuity files for improving curriculum development.

As the course director for MA385 (Chaos and Fractals), MA489 (Advanced Topics in Nonlinear Dynamics), MA489 (Advanced Topics in Mathematical Modeling and Programming), MA 487 (Mathematical Analysis II), MA493D (Topology) and MA493E (Functional Analysis), all of which were rarely-taught or new courses, developed the syllabi from scratch, and entered course-end reports into the Department's continuity files for improving curriculum development.

From AY99-AY01 developed and refined the Mathematics and Operations Research cadet capstone course, MA491, Research Topics in Applied Mathematics. This model was shared through interdisciplinary capstone projects with the Department of Social Sciences, the Department of Systems Engineering, the Department of Civil and Mechanical Engineering, and the Department of Electrical Engineering and Computer Sciences.

In AY94 served on the Department's MA104 applications and development committee. Authored a collection of projects for the course.

In AY00 served on an *ad hoc* Math-Science-Engineering subcommittee for coordinating cadet research topics and individual studies courses among MSE cadets.

During AY94 consulted for The College Board, and worked on a committee that developed a high school education module that was designed to teach predictability, uncertainty, nonlinear dynamics, and chaos at the high school level.

During AY11-12 developed a new core analytics sequence for all undergraduate business majors at DCB. Taught the sequence during AY12-13 and fully resourced the sequence for future instructors, to include developing reading libraries, test materials, and all course projects.

Served on the DCB BI&A committees for the development of the BSBA Analytics Major and MSBI degrees.

Selected Publications

Toney, S and P. Beaver, "A Comprehensive Analytics (Statistics, Data, and Technology) Sequence for Business Students," *Proceedings of the American Statistical Association Joint Statistical Meetings*, Section of Statistical Education, 2013.

Beaver, P. and D. Canright, "The Quasimonotonicity of Linear Differential Systems," *Applicable Analysis*, **70** (1-2), 1998, 67-73.

Beaver, P. and D. Canright, "The Quasimonotonicity of Linear Differential Systems – The Complex Spectrum," *Applicable Analysis*, **80**, 2001, 127-131.

Beaver, P., S. Quirk, and J. Sattler, "Object Identification in Greyscale Imagery Using Fractal Dimension," *Fractal Reviews in the Natural and Applied Sciences* (M. M. Novak ed.) Chapman and Hall, New York, 1995.

Beaver, P., et. al., *Predictability: From Uncertainty to Chaos, Student Activity Guide*, The College Board, New York, 1994.

Beaver, P., et. al., *Predictability: From Uncertainty to Chaos, Teacher's Guide*, The College Board, New York, 1994.

Beaver, P., "A Project that Worked?" *Mathematica Militaris*, **9** (1) Spring 1999, 9-10.

Beaver, P., "Make Way for Technology!" *Mathematica Militaris*, **9** (3) Fall 1999, 2-4.

Beaver, P., D. Matty, and M. Phillips, "Mathematical Research Programs at West Point in Support of the Army," *Mathematica Militaris*, **10** (1), Spring 2000, 17-19.

Beaver, P., "Digitization of the Battlefield—Problems and Issues," Proceedings of the 4th Annual Army Conference on Applied Statistics, Army Research Laboratory, February 1999.

Beaver, P., "Digitization of the Battlefield," *Proceedings of the 6th Annual ARL/USMA Technical Symposium*, 4-6 November 1998, USMA MSC#, 29-30.

Beaver, P., "Overheard in a Bar," *The Pi Mu Epsilon Journal*, **11** (3) Fall 2000, 138.

Beaver, P. and J. Shupenus, An Analysis of Transmission Times on the Digitized Battlefield, Department of Mathematical Sciences Technical Report, West Point, NY, 28 April 1999.

Beaver, P., An Analysis of the USSOCOM Strategy-to-Task Assessment Model, Department of Mathematical Sciences Technical Report, West Point, NY, 5 October 1999.

Beaver, P., *On the Quasimonotonicity of a Square, Linear Operator with respect to a Nonnegative Cone*, Naval Postgraduate School Doctoral Dissertation, 1998, and
Beaver, P., *Fractals and Chaos*, Naval Postgraduate School Master's Thesis, 1991.

Conference Governance

Site Coordinator, 5th U.S. Army Conference on Applied Statistics, West Point, NY 18-21 October 1999.

Site Coordinator and Host, 11th Annual Service Academy Student Mathematics Conference, 12-14 April 2001.

Local Organizer, Hudson River Undergraduate Mathematics Conference.

Department Representative, Service Academy Student Mathematics Conference.

Selected Presentations

“Object Identification in Greyscale Imagery using Fractal Dimension,” Third IFIP Conference on Fractals in the Natural and Applied Sciences (“Fractal 95 Conference”), Marseille, France, 7-10 February 1995.

Digitization of the Battlefield—Problems and Issues,” Fourth US Army Conference on Applied Statistics, Las Cruces, New Mexico, 18-20 October 1999.

Chaos, Complexity, and International Relations,” International Studies Association 41st Annual Convention (“ISA 2000 Conference”), Los Angeles, CA, 14-18 March 2000, with J. Parker and B Simpson.

“A Linear Model to Support USSOCOM’s Strategic Planning Process,” 68th MORS Symposium, USAFA, Colorado Springs, CO, 20-22 June 2000, with S. Horton.

“A Problem in Optimization and Simulation in Army Personnel Forecasting,” 72d MORS Symposium, Naval Postgraduate School, Monterey, CA, June 2004.

“An Optimization Model for Army Personnel Forecasting,” 10th Annual Korea-US Military Analysis Conference, Seoul, Korea, April 2003.

“Army Enlisted Personnel Management,” 7th Annual British-American Forecasting Exchange,” Stratford-on-Avon, UK, June 2003.

“Chaos in Quadratic Systems,” University of Missouri, Kansas City, Department of Mathematics Expository Talk Series, 31 March 1995.

“Chaos in More than One Dimension,” USMA Department of Mathematical Sciences Math Awareness Day Keynote Lecture, 7 April, 2000.

“Chaos and Fractals,” USMA Department of Mathematical Sciences Mathematics Forum Invited Lecture, 24 October 2000.

Service to the Department of Business Information and Analytics and the Daniels College of Business, University of Denver

Program Coordinator for the MS in Business Analytics, beginning in AY2013-2014. Responsible for curriculum content and coordination, assurance of learning, and program updates through coordination with our Board of Advisors, faculty, and industry professionals. *After the first year of this program I conducted a comprehensive curriculum review that resulted in significant program and curricular changes. This included leading an AOL committee based on the capstone projects that resulted in a redesign of the capstone sequence.*

Academic Advisor for the MSBA students, to include full time, part time, certificate, and concentration students.

Faculty Advisor to the MSBA Student Group.

Coordinate with Graduate Admissions for recruiting and candidate evaluation. Conduct webinars and hold meetings with MSBA candidates, attend recruiting events, and ensure our program materials and website are up-to-date.

Sequence Coordinator for INFO 4200, Capstone Planning, and INFO 4400, Capstone Course. Guide students through the analytic consulting process, coordinate with faculty advisors, and coordinate with corporate mentors for projects, to include conducting quality assurance for each project. Currently I am coordinating with over 110 companies, nonprofits, and governmental organizations to provide relevant analytic projects for our students.

Assurance of Learning coordinator for the Department. Prepare and submit the Department's annual Assurance of Learning report through coordination with our program coordinators for the Undergraduate Analytics Core, Undergraduate Analytics Major, and the MSBA (which is also my role).

Led the Department's effort to develop the Undergraduate Core Analytics Sequence (INFO 1010, 1020, and 2020) to include complete development of curricular content, customized textbook design through our publisher, creating of the library of readings, development of instructional data sets, and production of all evaluation instruments, to include a program-comprehensive final exam to be used for assurance of learning and program evaluation. *I have maintained my involvement with this program as I have continued to teach the core sequence, and am mentoring our adjunct and new faculty as they join the sequence and assume leadership roles in the program.*

Developed and presented Executive Education seminars, and am continuing to coordinate with the Executive Education office to further these programs.

Have taught for the Colorado Women's College, and the DCB PMBA and EMBA programs, to include development of a new course for the EMBA program, and the Executive Education program.

Service to the Department of Mathematical Sciences, USMA

Director, Mathematical Sciences Center of Excellence, AY99-01.

Director of faculty and cadet research.

Run the Department's Academic Individual Advanced Development (AIAD) program.

Department Representative to the Service Academy Student Mathematics Conference.

Publish *In the Lead*, the Department's Annual Research Report.

Write the Department's contribution to the Dean's Annual Research Report.

Manage and maintain faculty and cadet research publications and technical reports.

Editor-in-Chief, *Mathematica Militaris*, the Journal of the Service Academy Mathematics Departments, AY99-01, and also served as Managing Editor, AY01.

Member, Editorial Board, ARL/USMA Technical Symposium Proceedings AY00-01.

Colloquium coordinator, Department of Mathematical Sciences, AY93-94.

Research colloquium coordinator in conjunction with the Department's Center for Faculty Development, AY99-01.

West Point Distinguished Lecturer Series Committee representative from the Department of Mathematical Sciences, AY92-94. (Lecture host, AY93.)

MSE Committee and USMA POC for "West Point Projects Day," 4 May 2000.

Self-Appointed Department Librarian.

Student Development and Service, Department of Mathematical Sciences, USMA

Served as a Fourth Class (Freshman) Mentor for classes of 1995 and 2002.

Faculty Representative for the Women's Volleyball Team, AY93-94.

Faculty Representative and Assistant Coach of the Cadet Cycling Team, AY00-01.

Cadet Honor Education Team member, AY93-94.

Cadet Values Education member, AY00-01.

Academic Counselor for a cadet company, AY92-93.

Department AIAD coordinator, AY99-00.

Taught Military Science 102 during Winter Intersession, AY92-93.

Taught Military Science 202 during Winter Intersession, AY 99-00.

Ran an Infantry Committee site for Cadet Field Training, Summer 1992.

Served as a Company Trainer for Cadet Field Training, Summer 2000.

Awards and Honors

Graduated from United States Military Academy as a Distinguished Cadet (top 5%) 1983.

Selected and initiated into the Honor Society of Phi Kappa Phi, 1983.

Graduated with Distinction, Naval Postgraduate School, 1991.

Received the William R. Church Award for excellence in mathematics, NPS, 1991.

Selected and initiated into the Scientific Research Society Sigma Xi, 1991.

Received Phi Kappa Phi Scholastic Achievement Award, 1992.

Received Phi Kappa Phi Scholastic Achievement Award, 1993.

Selected and initiated into the National Honorary Mathematics Fraternity, Pi Mu Epsilon, 1999.

Memberships: MAA, AMS, SIAM, MORS, Sigma Xi, Phi Kappa Phi, Pi Mu Epsilon.

Operations Research and Analytic Consulting while at USMA

Consulted for the following organizations as a member of the Department of Mathematical Sciences, USMA. This list includes Summer Research Fellowships in addition to funded research positions during the academic years.

Army Research Laboratory, Sensors, Signals, Signatures, and Information Processing Directorate, Adelphi, MD. Worked on the problem of object identification in grayscale imagery using fractal dimension, 1993-1995.

Army Digitization Office, the Pentagon. Led a research cell of 8 Department members in conducting research on digitization of the battlefield, AY99.

Army Digitization Office, the Pentagon. As the Department's Director of Research, coordinated a research partnership with ADO that included 14 faculty members working on three separate projects, and was funded for \$21,000.

Warfare Analysis Integration Center, Alexandria, VA. Provided statistical analysis of digitized transmission times to the WAIC for use in the ADO presentation to Congress on battlefield digitization.

United States Special Operations Command, MacDill AFB, FL. Provided analysis on the Strategy-to-Task Assessment Model (STAM) used by USSOCOM to weight and prioritize tasks based on the National Security Strategy. Wrote a model to take the STAM output and determine program funding for USSOCOM, 1999.

Deputy Chief of Staff for Personnel, the Pentagon. Participated as part of a team with the Department of Operations Research and Systems Analysis to provide analysis for the Chief of Staff force manning study. Worked with the same group on the enlisted force structure requirements by providing modeling, verification, and validation for their effort, AY00.

The College Board, New York, NY. As part of a team of consultants, developed a module for teaching predictability, uncertainty, and chaos to high school students. Was the primary author of the two published modules (the Student Activity Guide and the Teacher's Guide) 1994.

O'Neill High School, Highland Falls, NY. Consulted for mathematics curriculum development in the use of spreadsheets in mathematical modeling.

As Director of Faculty and Cadet Research for the Department of Mathematical Sciences, maintained outreach contact with the US Army Aberdeen Test Center, the Topographic Engineering Center, STRICOM, OSD DOT&E, and NASA. Established Cadet and Faculty research fellowships with over a dozen agencies, including the ones listed here.

Army Research Office, Research Triangle Park, NC. Board of Advisors, serving while a Senior Analyst on the Joint Staff in the Pentagon, 2008.

Professional Operations Research and Business Analytics Experience

The Army Staff, Pentagon, Washington, D.C., Branch Chief and Senior Analyst, 2001-2004

Responsible for the Army's enlisted personnel strength forecasting. Conducted the analysis that drove the Army's recruiting, assignment, retention, promotion, separation, stop-loss, and initial-entry training programs.

- Served as the Government Program and Technical Lead for the development and maintenance of the Enlisted Grades and Enlisted Specialties models, a \$25 million suite of models used for personnel strength forecasting.
- Briefed Congressional committees to support the \$38 billion Army Personnel budget.
- Developed the program to increase the Army's personnel strength to support the Global War on Terror in March, 2003. The President and Secretary of Defense approved the plan, Congress funded it, and it remained in place through July, 2009.
- After the 9/11 attack on the Pentagon, had the Branch back to work by 9/13 in temporary spaces, and recovered our servers from the Pentagon, allowing the Branch to be fully operational by the following Monday, 9/17.

The Joint Staff, Pentagon, Washington D.C., Branch Chief and Senior Analyst, 2005-2008

Responsible to the Chairman of the Joint Chiefs of Staff for analysis of Department of Defense force structure, to include determining if the structure is sufficient to meet the National Defense Strategy.

- Ran the Department of Defense's rotation study, which was the capstone study for the Quadrennial Defense Review.
- Coordinated analytic results with the four Services, the Joint Staff, and the Office of the Secretary of Defense, resulting in recommendations that led to significant changes in future programmed force structure.
- Developed and managed a \$4 million contract for the Department of Defense force structure analysis tool. Provided the government specifications for the model and ensured the delivered product met the government's requirements.
- Served as the project lead for the "Global Force Management Data Initiative," a program that codified Service authorization data as the cornerstone for building the Department of Defense's Global Information Grid.

Claremont Information Systems, INC., Chief Analytic Officer, Denver, CO, 2011-2012

Patent Pending, "System and Methods for Optimizing Real Estate Foreclosure Auction Pricing."

R.Index, (CO Holdings) Chief Data Scientist, Denver, CO and NYC, NY, 2012-present

DocBuddy, INC., Board of Directors, Denver, CO, 2014-present

ProTechSure, Board of Advisors, Aurora, CO 2014-Present

Cypress Partners, Chief Analytic Officer, Denver, CO 2012-present

Business Analytics Consultant while at the University of Denver

- Claremont Information Systems, LLC, Denver, Colorado, 2010-2011
- BlackBox Logic, LLC, Denver, Colorado, 2010-2011
- Allonhill, LLC, Denver, Colorado, 2011-2012
- Government Sales, Inc, (GSISolutions.org), Denver, Colorado, 2010-2011
- CoorsTek, Golden, Colorado, 2009
- Denver Medical, Chief of Radiology, Denver, Colorado, 2011
- CoBank, Greenwood Village, Colorado, 2014
- ProTechSure, Aurora, Colorado, 2014
- Metrolist, Denver, Colorado, 2014
- Cengage Learning, Mason Ohio, 2012
- BrainTemp, INC. Englewood, CO 2014
- Crocs, Niwot, CO, 2012
- Secure Ideas, Denver, CO 2014

Commercial Real Estate Professional

- Libra Enterprises, LLC, Santa Barbara, CA, Board of Directors and Founding Partner, 1977-present.
- Beaver, INC., Santa Barbara, CA, Board of Directors, 1981-present.
- Pacifica Real Estate Group, Santa Barbara, CA, Part Owner and Board of Directors, 1991-present.

United States Army Infantry Officer (1983-2008)

Served as a commissioned officer in the United States Army for over 25 years, retiring as a Colonel. In addition to the academic assignments and the operations research analyst positions listed above, served in the following assignments as an Infantry officer.

82d Airborne Division, Fort Bragg, North Carolina, 1983-1987

- Rifle Platoon Leader
- Company Executive Officer
- Support Platoon Leader
- Battalion Operations Officer

2d Infantry Division, Camp Greaves, Korea, 1987-1989

- Battalion Adjutant/Personnel Officer
- Rifle Company Commander

Military Awards and Decorations

- Legion of Merit
- Joint Service Commendation Medal
- Army Achievement Medal (2)
- Global War on Terror Service Medal
- Army Service Ribbon
- Expert Infantryman Badge, Ranger Tab, Senior Parachutist Badge
- Meritorious Service Medal (4)
- Army Commendation Medal
- National Defense Service Medal (2)
- Korean Defense Service Medal
- Overseas Service Ribbon