

NOMINATION COVER SHEET
2009 Virginia Outstanding Faculty Awards

1. <u>NAME</u>	
Full (Legal): Dr. James C. Duchamp. Preferred First Name: Jim	
2. <u>INSTITUTIONAL INFORMATION</u>	3. <u>PROFESSIONAL INFORMATION</u>
Institution: Emory & Henry College Rank/Position Title: Full Professor Year Rank/Title Attained: 2006 Years at Institution: 14 Campus Email Address: jducham@ehc.edu Campus Phone: 276-944-6183 Campus Mailing Address: Department of Chemistry Emory & Henry College P.O. Box 947 Emory, VA 24327 Campus Communications Contact: -Name: Dirk Moore -E-mail: dsmoore@ehc.edu	Academic Discipline: Chemistry Specialization/Field: Physical Chemistry Type of Terminal Degree: Ph. D. Year Awarded: 1992 Awarding Institution: Yale University
	4. <u>PERSONAL INFORMATION</u>
	Home Phone: Home Mailing Address:

Please check only one box:

- RESEARCH/DOCTORAL INSTITUTION NOMINEE:**
MASTERS/COMPREHENSIVE/BACCALAUREATE INSTITUTION NOMINEE:
TWO-YEAR INSTITUTION NOMINEE:
RISING STAR NOMINEE:
TEACHING WITH TECHNOLOGY NOMINEE:

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President or Chief Academic Officer

Signature: 

Printed Name: _____ Dr. Chris Qualls, VP of Academic Affairs _____

MISSION STATEMENT OF EMORY & HENRY COLLEGE

“Increase in Excellence,” the historic motto of Emory & Henry College, expresses our intention to be a learning community that moves toward fulfilling every student’s potential. Bishop John EMORY, along with the founders of Methodism, symbolizes our belief in the union of faith and learning, while Governor Patrick HENRY symbolizes our commitment to freedom and civic virtue.

We affirm the Christian faith as our spiritual and moral heritage and encourage all our members to grow in faith as they grow in knowledge. We believe in the worth of each person's religious and cultural heritage, inasmuch as that heritage leads to service to others in our region and the larger world.

We affirm the liberal arts as our intellectual foundation and believe that excellence results when everyone actively participates in the educational process. We challenge all persons to confront historical and contemporary ideas and issues and to develop the ability to think critically about all areas of human experience.

These traditions provide the context for our pursuit of excellence, as we engage a diverse group of well-qualified men and women in educational experiences that lead to lives of service, productive careers, and global citizenship.

Summary of Accomplishments

Dr. Michael Duffy, a physics professor and a colleague of Dr. Jim Duchamp, relates the following story about Emory & Henry's nominee for the Outstanding Faculty Award:

"Early in Jim's tenure here I visited one of his labs as part of our faculty evaluation process, and I started questioning one of his students. She explained the procedure she was using and what she expected to find. But I wanted to know what was really happening, what the bumps on the recording chart really meant and how the machine produced them. She stumbled badly. She was too uncomfortable to reason out the problem with two scary professors staring at her. I am constantly confronted with this same problem; our students are fairly adept at learning skills, but this competence often blinds us to the depths of their ignorance. This student's discomfort was palpable, but at that moment it was Jim's position I identified with. It's always disheartening when it seems that, despite all our hard work, we've somehow failed to get the real point across. And, of course, it's bound to happen when there's a visitor in the class, one evaluating you. Jim's concern and compassion for the student was obvious. He was able to work with her, getting her started on the road to understanding, and allowing her to survive the ordeal with as much of her dignity as possible still intact. This student could easily have been crushed, but instead, went on to be a successful student and graduate. It's a small incident but, to me, it spoke volumes about the quality of the teacher we'd hired. I haven't been disappointed in the decade since."

The above experience is just one illustration of the devotion and care demonstrated by Dr. Duchamp, who has combined his immense talent as a researcher with his love of students to become a rare gift in the field of science education.

Dr. Duchamp is a perfect fit for our liberal-arts institution, whose work both inside and outside of the classroom has had a major impact on the life of the College. His undergraduate experience at Kalamazoo College, his graduate work at Yale, and postdoctoral study at Cornell has well prepared him to excel at both classroom instruction and cutting-edge research. Dr. Duchamp is legendary for his availability to students. He is often found working late in his office at the same time students are studying in laboratories or in the library. On many occasions he has interrupted his work to join students in late-night study sessions.

As an instructor, Dr. Duchamp teaches some of the college's most difficult courses (Physical Chemistry; Inorganic Chemistry) and yet his course ratings are some of the highest found within the Natural Science Division. Early in his tenure, Jim developed a collaboration with Virginia Tech, where he now holds the title of Research Associate Professor. This research partnership, focused on the study of Endohedral Metallofullerenes (often used as contrast agents in MRIs), has led to a patent, the publication of a book and the publication of almost two dozen articles in the past 10 years. At a College devoted to making a difference in the world, Dr. Duchamp's research is a great source of pride to us. The results he has had in the laboratory have made an important difference in the technology used in the detection of tumors.

In addition, Dr. Duchamp's work has appeared in prestigious journals such as *Nature*, *Radiology*, and the *Journal of the American Chemical Society*. I also have appreciated how he has involved our students in his research (three of our students have been coauthors with Jim) through arranging summer research opportunities for them through his association with Virginia Tech.

Amazingly Dr. Duchamp's superb teaching and scholarship have not occurred at the expense of his service to the college. Throughout his tenure, he has chaired many important faculty

committees including our Advisory and Lyceum committees. Additionally, Jim served as Chemistry Chair for five years during which he was the co-developer of an undergraduate research symposium, *Sciencefest*, which has provided dozens of students in the sciences the opportunity to present their research. For the past two years, he has served as Division Chair for the Natural Sciences. On enough occasions to make it noteworthy, when his colleagues projects in which they are involved in or the genesis of an idea, Dr. Duchamp's name pops up, as author, the collaborator, the inspiration, or the helping hand.

Because of his tireless commitment to students, his belief in the value of his work and the impact that his research and service have had on students and the lives of others beyond this community, Emory & Henry takes tremendous pride in nominating Dr. Duchamp for the Outstanding Faculty Award.

Discovery

- Professor Duchamp began work with colleagues at Virginia Tech supported by an Appalachian College Association fellowship in 1999. During his first summer he synthesized an endohedral fullerene molecule that violated the isolated pentagon rule – that is carbon cage molecules which are made up of hexagons and pentagons of carbon are not allowed to have adjacent pentagons. (e.g. think of the each vertices of a soccer ball as a carbon atom forming a sixty atom carbon cage). Endohedral fullerenes are carbon cages that surround other atoms. The discovery and characterization of this molecule, $\text{Sc}_3\text{N}@\text{C}_{68}$ was reported in *Nature*. $\text{Sc}_3\text{N}@\text{C}_{68}$ is a sixty-eight carbon cage that surrounds three scandium atoms and one nitrogen atom.
- In seven summers and a sabbatical year of collaboration with colleagues at Virginia Tech and undergraduates from Emory & Henry, Professor Duchamp has synthesized and characterized numerous endohedral fullerenes. Fourteen papers and two book chapters have resulted. Highlights include:
 - The “Buckyegg” fullerene, $\text{Tb}_3\text{N}@\text{C}_{84}$, which is a fascinating egg-shaped fullerene – most fullerenes are spherical or football shaped. (reported in the *Journal of the American Chemical Society*)
 - A new functionalized endohedral fullerene species $\text{Gd}_3\text{N}@\text{C}_{80}[\text{DiPEG5000}(\text{OH})_x]$ demonstrates dramatically enhanced magnetic resonance imaging relaxivity in both *in vitro* and *in vivo* studies. When this nanoparticle is infused directly into the brain of a tumor-bearing rat, it demonstrates a prolonged residence and a clear depiction of the extent of the growing tumor mass. (reported in *Radiology*)
 - A new isomer has been discovered for the endohedral $\text{Sc}_3\text{N}@\text{C}_{80}$. Unlike the dominant isomer with icosahedral, I_h , symmetry, this molecule has D_{5h} symmetry. The differences in symmetry are reflected in different reactivities of the isomers. (reported in *Chemical Physics Letters*)
 - In order to exploit fullerenes for medical applications, it was necessary to develop chemical methods that would allow the fullerenes to dissolve in water. With co-workers, Professor Duchamp developed a method that overcame a difficult problem related to fullerene reactivity. Professor Duchamp is co-inventor on United States Patent 7,358,343: *Endohedral metallofullerene derivatives*. This patent is licensed Virginia-based Luna Innovations Inc. and helps support the economic vitality in the commonwealth.
- Work characterizing the transient nature of nitroxide hydrogen bonding using dynamic nuclear polarization and density functional theory methods. This work characterized

the short-lived solvent-solute interactions, such as transient complex formation, that are governed by weak hydrogen bonding interactions and take place with a 10^{-8} to 10^{-11} s timescale. (reported in the *Journal of the American Chemical Society*)

- Numerous multiple bonded and highly strained main group molecules have been characterized using solid state NMR to measure the anisotropic nature of the bonding. This work has been essential toward the understanding of bonding in main group molecules.

Knowledge Integration

- During the summers of 2004 and 2005, Duchamp co-organized a National Science Foundation Nanoscience Undergraduate Education short course on fullerenes and nanomaterials for Appalachian College Association (ACA) students and faculty. During the four-day courses, faculty and students from eight ACA colleges were able to synthesize, purify and characterize a variety of nanomaterials interspersed with lectures about nanotechnology. Duchamp also made a presentation about the short course at the ACA Summit in 2004.
- Duchamp's dedication to the mission of Emory & Henry is reflected by his participation in the General Education Program. He developed a course called "Ethical Inquiry: Technology & Values," which has been oversubscribed each time he has taught it. The course begins with a grounding in moral theory and critical thinking skills, then has students apply them to a variety of ethical questions focusing on technology and society. The course helps students to refine and synthesize their opinions relating to privacy, appropriate use of technology, medical issues, end-of-life issues, genetically modified organisms, global warming, energy, workplace situations, whistle blowing and nanotechnology.
- Duchamp has co-authored two book chapters relating to nanotechnology. One chapter was focused on endohedral metallofullerenes – that is, carbon cages with metal atoms trapped inside -- in a book for nanoscientists interested in learning about this new class of compounds. His other chapter was broader and focused on fullerenes in a manner appropriate for an upper level undergraduate chemistry course or introductory graduate level course. The text has been used at several institutions and Professor Duchamp is developing a special topics course in nanomaterials based on the text.
- Professor Duchamp's graduate training is in nuclear magnetic resonance spectroscopy, but his work has lent insight to questions from diverse areas including nutrient cycling in the oceans, processing of xerogels into silicates, the nature of multiple bonding in main group elements, quantum mechanical tunneling for hydrogen atoms in metal hydrides, and the nature of radical – substrate hydrogen bonding interactions in solution.
- Professor Duchamp has also significantly improved yields by designing an improved Krästchmer-Huffman device to synthesize fullerenes, endohedral fullerenes and nanotubes. Devices designed by Professor Duchamp are in use at Virginia Tech and the University of Southern Mississippi have contributed to more than fifty publications and one hundred presentations.

Scholarship of Teaching

- Duchamp has conducted undergraduate research with numerous undergraduate students resulting in three papers co-authored by Emory and Henry College students. Working with Kerra Fletcher E&H'04, a new isomer of the metallofullerene $ScN_3@C_{80}$ was synthesized and reported in their paper, *An isomer of the endohedral metallofullerene $Sc_3@C_{80}$ with D_{5h} symmetry*, published in *Chemical Physics Letters*.

During a summer spent at Virginia Tech, they investigated possible medical applications in a paper in *Nanoletters* with the title *Lutetium-based Trimetallic Nitride Endohedral Metallofullerenes: New Contrast Agents*. Duchamp continued his work with chemistry major Anthony Leonard, E&H'07 investigating the relaxivity of gadolinium endohedral metallofullerenes in collaboration with researchers at Virginia Tech and Virginia Commonwealth University. Their paper, *In Vitro and In Vivo* Imaging Studies of a New Gadolinium Endohedral Metallofullerene MRI Contrast Agent has been published in the journal *Radiology*.

- Duchamp served as an organizer of a Virginia Foundation of Independent Colleges Technology workshop hosted by Washington & Lee University in 1999. The workshop focused on the use of technology to enhance chemistry education.
- Duchamp is a trailblazer in the effective use of technology to enhance the education of his students. He has developed an extensive collection of online tools (movies, pictures, handouts, online problem sets, lecture notes) to enhance learning in his courses. He uses the open source software *Moodle* to deliver his content to students. In the classroom, he uses a wireless bluetooth tablet to allow students to participate in problem solving – making his classes much more active.
- Duchamp is unusual in the breadth of courses he has taught – spanning the entire chemistry curriculum. Chemistry & Society, Environmental Chemistry, General Chemistry I & II, Organic Chemistry II, Physical Chemistry I & II, Inorganic Chemistry, and Instrumental Analysis. He has also taught Conceptual Physics, Introduction to Computer Science and Ethical Inquiry: Technology & Values.
- Duchamp has participated in numerous meeting relating to learning and undergraduate research including – Appalachian College Association (ACA) Technology Summits, Knoxville, 1998, 1999, 2004, ACA Teaching Learning & Technology Meeting, Kingsport, 1997, 1999, a Computer Visualization and Animation Techniques throughout the Chemistry Curriculum, 1997, a Molecular Modeling in the Undergraduate Curriculum, Richmond, 1997, Council on Undergraduate Research, April Dialogue, Washington D.C., 1995, 1997, ChemMIST Workshop, Berea, Kentucky, 1995 and Appalachian College Science Teachers Workshops, Berea, Kentucky, 1994, 1995.

Scholarship of Service

- Duchamp is the founding faculty advisor of the Emory & Henry College Chapter of the Student Affiliates of the American Chemical Society. He advised the chapter from 1998-2007. The Emory & Henry chapter has won four awards for its outstanding activities and contributions during the last six years. These include activities on campus – making liquid nitrogen ice cream, chemistry themed picnics, and outreach to the community and local schools. Both Professor Duchamp and the E&H chapter were featured in separate issues of *In Chemistry* magazine in 2006. A photo of two E&H student performing outreach for area 4th graders appeared in *Chemical & Engineering News*, the weekly newsmagazine of the American Chemical Society.
- Professor Duchamp secured donation of the first FTNMR (a 300 MHz instrument) for the E&H Chemistry program.
- Professor Duchamp has served as Chemistry Department Chair, 2002-2006, and since 2006 serves as Chair of the Natural Sciences. He supervises five departments and three programs. In 2006, Duchamp attended Council of Independent College

Academic Leader Training in St. Louis. He is known for his work in developing young faculty, his work to upgrade and maintain E&H's modern scientific instrumentation, and his support for undergraduate research.

- Professor Duchamp has made extensive contributions to the Northeast Tennessee Section of the American Chemical Society (NETS-ACS). After several years as website coordinator and newsletter editor, he was elected to a three year term the board in 1999. He attended local section leader training in Tampa in 2001. He served on the board of the NETS-ACS from 1999-2003 and as chair of the ~500 member section in 2002.
- Duchamp has reviewed grant proposals for the United States Department of Agriculture and the Petroleum Research Fund. He has also served as a reviewer for the student affiliate program of the American Chemical Society.
- During his years at E&H, Professor Duchamp has served on more than twenty-seven committees – chairing five standing committees. He currently serves on Academic Council, Master Planning Steering Committee, Safety Committee, Crises Management Task Force, the Pandemic Flu Preparedness Committee, and Ethical Inquiry Task Force.
- Duchamp co-chaired the E&H College's Natural Science Division undergraduate research symposium from 1998-2006. During this time more than sixty students presented their original research projects. From humble beginnings, Professor Duchamp grew the event to a two-day symposium with undergraduate presentations (posters and talks), a banquet for senior science majors, and an alumnus keynote event.
- Professor Duchamp has been instrumental in the Emory & Henry's work with chemicals. Coordinating chemical waste disposal, developing a web-based chemical inventory system and drafting the college chemical hygiene plan.
- Professor Duchamp was Principal Investigator on the E&H's first grant proposal to NSF after a lapse by E&H of more than ten years. He coordinated E&H's sponsored research with NSF from 1995-2006. Professor Duchamp is a leader in facilitating extramural funding at Emory & Henry College. He has served as Council for Undergraduate Research Institutional Liaison since 1998.
- Professor Duchamp is a member of the American Chemical Society, the Council on Undergraduate Research, the National Science Teacher Association, the Virginia Academy of Sciences and the United States Rowing Association.
- Professor Duchamp regularly works with local schools as science judge for science fairs and academic competitions.

Personal Statement

Of course, I love watching students learn and being a part of that process. I'm thrilled when, for example, a student opens up a calorimeter, a device used for measuring heat in chemical reactions, for the first time to discover that the sample has "disappeared" (well – actually it was combusted into two colorless and odorless substances – carbon dioxide and water).

But I'm even more excited by the students themselves. I adore young people, especially the type who are most often drawn to private, liberal arts colleges, and even more pointedly, the type of students who come to Emory & Henry College. Yes, I know it is a bad pun, but I really have "chemistry" with these students. They not only delight me, they make me feel, as so many of them also feel, that the work we do at this College means so much more than education; it's about improving their communities and the world.

Surprisingly, the experience that prepared me for a chemistry faculty position in rural Appalachia has nothing to do with science – it was my six-month study abroad experience at the University of Sierra Leone.

Growing up in Michigan thousands of miles from my extended family in California and Louisiana, I was shocked by the strong ties that Sierra Leonean students had to their extended families and communities. Coming to Emory & Henry invokes similar feelings. I have become part of a close-knit community dedicated to excellence, education, faith and service.

After nearly seven years of graduate work and research, a Ph.D. from Yale University and a postdoctoral appointment in the Chemical Engineering Department at Cornell University, I began looking for a permanent faculty position. The sole criteria I used as I searched for a teaching job was that the school be a student-centered institution with a focus on producing outstanding, thoughtful and contributing citizens.

Undergraduate research also played an important role in my decision to work at a small, excellence-focused, liberal arts college, and the research I'm most proud of has involved undergraduate collaborators.

One student spent a summer with me at Virginia Tech working to synthesize carbon-13 labeled endohedral fullerenes (really fascinating molecules that consist of a carbon cage – similar to a soccer ball with every vertex a carbon atom and core cluster of a nitrogen molecule surrounded by three metal atoms). Much of the work is aimed at providing better, safer magnetic resonance images (MRIs) in the detection of tumors.

After weeks of synthesis and purification, we finally obtained a magnetic resonance spectrum with extra peaks. We were expecting two peaks in a 3:1 ratio but found six extra peaks. Having spent a few weeks purifying our sample, we were stunned that the sample was impure. I noticed the additional peaks seemed to be in a 1:2:2:1:1:1 ratio – after referring to a reference book, it was clear the peaks represented a new arrangement of carbon atoms on the cage.

The student's disappointment at having accomplished very little during the summer was replaced by joy at having discovered a new molecule that was reported in a paper she co-authored in *Chemical Physics Letters*, a talk she presented at Emory & Henry's undergraduate research symposium, and a poster presentation at a National American Chemical Society meeting.

One of the difficulties in working with small amounts (milligrams to micrograms) of sample is measuring concentrations. Another student working with me measured tiny amounts of sample using inductively coupled plasma spectroscopy. This experimental data was combined with data from collaborators to show the potential magnetic resonance imaging contrast agents were 50 times more sensitive than commercially available contrast agents. The research was published

in the medical research journal *Radiology*. During the students MD/PhD program interview, he met with a professor who just happened to have the issue of *Radiology* with the article that he had co-authored on the desk. His paper was quite the conversation starter.

I've enjoyed immensely working with undergraduates on research projects as I help them grow as scientists. Observing a student's excitement as she realizes she has synthesized a novel molecule, another's shock at realizing that making a few milligrams of the molecule cost about \$10,000, and my students sharing of their original research with the wider scientific community – all of this is always thrilling for me, much more exciting than my own discoveries and presentations.

I have sought to provide undergraduate researchers with a multi-faceted view of chemistry that often reflects my own research interests. I feel the most exciting research involves high-quality experiments yielding interesting data and a healthy dose of theory to explain the data. Nearly all of my projects have this mixture. My first work relating to fullerenes actually began in 1990 as a graduate student. A researcher at Bell labs had sent me a sample containing ~100 milligrams of C₇₀ – “about half the world's supply” at that time. My goal was to make measurements relating to the bonding in this football-shaped molecule by performing low-temperature magnetic resonance experiments.

After a couple of weeks of unsuccessful experiments, I achieved some important discoveries related to methods for keeping the apparatus from becoming a large ice block and identification of an impurity in the sample. Eventually, I co-invented a method, which is now patented, for helping fullerenes dissolve in water, which dramatically improves their usefulness in MRIs.

As my students become more engaged in research, I become more engaged in having them share with even younger people the thrill of chemistry. Together my students and I lead a variety of scientific demonstrations as an outreach to children in our community. The demonstrations lead to “ooh's” and “aah's” as fourth graders watch two solutions mixed together glow in a darkened room. Then there are the “yummy” remarks following the making of ice cream from heavy cream, sugar, vanilla and the very mysterious liquid nitrogen. There are the wide-eyed stares that come with can-crushing and egg-sucking demonstrations of pressure variances. And there's the work with 11th and 12th graders as they synthesize a bright orange dye and use that dye to color wool. With each demonstration E&H students proudly and expertly field questions from the younger students. Accompanying these young students are often many of my former students who are now high school teachers. Seeing this interaction of former, current and future college chemistry students will never get old.

And it never ceases to inspire me as I strive to make chemistry accessible to greater numbers of college students. Beginning science students tend to approach chemistry with dread – something to be overcome on their way to careers as doctors or pharmacists. I revel in connecting students to the chemistry that pervades their surroundings – the surprise on students' faces when they realize the chemical that makes Styrofoam cups is the same as the chemical used to make a CD case, for example. I never tire of performing demonstrations in class and then having students work in small groups to explain what happened. How if the substances in the three graduated cylinders are the same, why did one fizz slightly, one fizz moderately and one fizz abundantly (out of the cylinder and onto the counter!)? In addition to helping students learn chemistry, I seek to communicate both an enthusiasm and sense of purpose about chemistry in their lives.

When I work with students on projects, I really want them to feel that same excitement of discovery. I want them to understand how important they are to the application of scientific knowledge in service to the larger world. They do, and I am genuinely and daily thrilled because of it.

ABBREVIATED CURRICULUM VITAE

Department of Chemistry
Emory & Henry College, Emory, VA 24347-0947

(276) 944-6183
jcducham@ehc.edu

PROFESSIONAL EXPERIENCE

2006 - Present	Emory and Henry College	Professor
2006 - Present	Emory and Henry College	Chair, Natural Science Division
2004 - Present	Virginia Tech	Research Associate Professor
2003 - Present	Emory and Henry College	James Earl Copenhaver Professor in Chemistry
2002 - 2006	Emory and Henry College	Chair, Department of Chemistry
2001 - 2006	Emory and Henry College	Associate Professor
2001 - 2002	Virginia Tech (sabbatical)	John B. Stephenson Fellow
1994 - 2001	Emory and Henry College	Assistant Professor

Professional Interests: Synthesis and characterization of endohedral fullerenes, calculation and measurement of chemical shift anisotropies in novel compounds and materials; using technology to enhance learning.

Courses Taught: Chemistry & Society, General Chemistry I & II, Organic Chemistry II, Physical Chemistry I & II, Inorganic Chemistry, Instrumental Analysis, Introductory Computer Science, Conceptual Physics and Ethical Inquiry: Technology & Values.

1992 - 1994 **Cornell University** **Postdoctoral Research Associate**
Postdoctoral associate in the School of Chemical Engineering.

EDUCATION

1987 - 1991 **Yale University** **Ph.D. in Physical Chemistry, 1992**
Thesis Advisor : Kurt W. Zilm

1983 - 1987 **Kalamazoo College** **B.A. in Chemistry, 1987**
Foreign Study at Fourah Bay College, University of Sierra Leone, (85-86)

PROFESSIONAL ACTIVITIES AND ASSOCIATIONS

Member American Chemical Society, Council on Undergraduate Research., National Science Teacher Association., Virginia Academy of Sciences.

SELECTED PUBLICATIONS

Purification of Trimetallic Nitride Templated Endohedral Metallofullerenes by a Chemical Reaction of Congeners with Eutectic 9-Methylanthracene Angeli, C. D.; Cai, T.; Duchamp, J. C.; Reid, J. E.; Singer, E. S.; Gibson, H. W.; Dorn, H. C. *Chem. Mater.* **2008**, *20*, 4993 – 4997.

Preparation and Structural Characterization of the I_h and the D_{5h} Isomers of the Endohedral Fullerenes $Tm_3N@C_{80}$: Icosahedral C_{80} Cage Encapsulation of a Trimetallic Nitride Magnetic Cluster with Three Uncoupled Tm^{3+} Ions Zuo, T.; Olmstead, M. M.; Beavers, C. M.; Balch, A. L.; Wang, G.; Yee, G. T.; Shu, C.; Xu, L.; Elliott, B.; Echegoyen, L.; Duchamp, J. C.; Dorn, H. C. *Inorg. Chem.* **2008**, *47*, 5234 – 5244.

Endohedral metallofullerene derivatives H. C. Dorn, E. B. Iezzi, J. C. Duchamp *United States Patent* 7,358,343, 2008.

Nitroxide/Substrate Weak Hydrogen Bonding: Attitude and Dynamics of Collisions in Solution Russ, J.L., Gu, J., Tsai, K.-H., Glass, T., Duchamp, J.C., and Dorn, H.C. *J. Am. Chem. Soc.*, **2007**, *129*, 7018 - 7027.

Isolation and structural characterization of a family of endohedral fullerenes including the large, chiral cage fullerenes $Tb_3N@C-88$ and $Tb_3N@C-86$ as well as the $I-h$ and $D-5h$ isomers of $Tb_3N@C-80$. Zuo, T. M.; Beavers, C. M.; Duchamp, J. C.; Campbell, A.; Dorn, H. C.; Olmstead, M. M.; Balch, A. L., *J. Am. Chem. Soc.* **2007**, *129*, 2035.

$Tb_3N@C-84$: An improbable, egg-shaped endohedral fullerene that violates the isolated pentagon rule. Beavers, C. M.; Zuo, T. M.; Duchamp, J. C.; Harich, K.; Dorn, H. C.;

- Olmstead, M. M.; Balch, A. L., *J. Am. Chem. Soc.* **2006**, 128, (35), 11352.
- In vitro and in vivo imaging studies of a new endohedral metallofullerene nanoparticle.*
 Fatouros, P. P.; Corwin, F. D.; Chen, Z. J.; Broaddus, W. C.; Tatum, J. L.; Kettenmann, B.; Ge, Z.; Gibson, H. W.; Russ, J. L.; Leonard, A. P.; Duchamp, J. C.; Dorn, H. C., *Radiology* **2006**, 240, 756.
- Preparation and structure of CeSc₂N@C₈₀: An icosahedral carbon cage enclosing an acentric CeSc₂N unit with buried f electron spin.* Wang, X. L.; Zuo, T. M.; Olmstead, M. M.; Duchamp, J. C.; Glass, T. E.; Cromer, F.; Balch, A. L.; Dorn, H. C., *J. Am. Chem. Soc.* **2006**, 128, 8884.
- Purification of Endohedral Trimetallic Nitride Fullerenes In A Single, Facile Step* Z. Ge, J. C. Duchamp, T. Cai, H. W. Gibson, H. C. Dorn, *J. Am. Chem. Soc.* **2005**, 127, 16292-16298.
- Fullerenes* H. C. Dorn, J. C. Duchamp, in *Nanoscale Science and Technology*, edited by M. Di Ventra, S. Evoy, R. Heflin, Kluwer Academic Press, 2004.
- NMR Chemical Shifts. Substituted Acetylenes* K. B. Wiberg, J. D. Hammer, K. W. Zilm, T. A. Keith, J. R. Cheeseman, J. C. Duchamp *J. Org. Chem.* **2004**, 69, 1086-1096.
- An isomer of the endohedral metallofullerene Sc₃N@C-80 with D-5h symmetry,* J. C. Duchamp, A. Demortier, K. R. Fletcher, D. Dorn, E. B. Iezzi, T. Glass, H. C. Dorn *Chem. Phys. Lett.* **2003** 375, 655-659.
- Sc₃N@C₆₈: Folded Pentalene Coordination in an Endohedral Fullerene that Does Not Obey the Isolated Pentagon Rule* M. M. Olmstead, H. M. Lee, J. C. Duchamp, S. Stevenson, D. Marciu, H. C. Dorn, A. L. Balch *Angew. Chem.* **2003**, 42, 900-903.
- Lutetium-based Trimetallic Nitride Endohedral Metallofullerenes: New Contrast Agents,* E. B. Iezzi, J. C. Duchamp, K. R. Fletcher, T. E. Glass, H. C. Dorn *Nano Letters*, **2002**, 2, 1187-1190.
- A Symmetric Derivative of the Trimetallic Nitride Endohedral Metallofullerene, Sc₃N@C₈₀* E. B. Iezzi, J. C. Duchamp, K. Harich, T. E. Glass, H. M. Lee, M. M. Olmstead, E. B. Iezzi, J. C. Duchamp, A. L. Balch, H. C. Dorn, *J. Am. Chem. Soc.* **2002**, 124, 524-525.
- Isolation and Structural Characterization of the Endohedral Fullerene, (Sc₃N@C₇₈)* M.M. Olmstead, A. de Bettencourt-Dias, J.C. Duchamp, S. Stevenson, H.C. Dorn, A.L. Balch, *Angew. Chem.* **2001**, 40, 1223-1225.
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LETTERS OF SUPPORT

Dr. James Duchamp was the absolutely best part of my experience at Emory & Henry College. The impression he has made on me fundamentally changed my perspective. I first met Dr. Duchamp in the fall of 2003 as a freshman student in General Chemistry. I was dead-set on a career in the practice of medicine. Research for me was simply a means to an end – matriculation into medical school. **If I knew then the profound effect that time spent in research with Dr. Duchamp would have on my life now – four years in the future as a research-oriented MD/PhD student – I would most likely have been trembling with nervousness at our introduction.** Through my freshman year, his effervescence and enthusiasm in teaching were matchless. In each class, there was guaranteed to be at least one of his trademark giggles accompanied with a hearty smile and a chemistry joke. The excitement apparently rubbed off on me. About halfway through the spring semester, he pulled me aside and asked, “Have you ever thought about research?”

Under the impression that I, a lowly freshman, was too inexperienced for any type of scientific research, I was a bit hesitant in my reply, “Yeah...” I was overwhelmed when he then invited me to participate in a competitive National Science Foundation-sponsored summer Research Experience for Undergraduates program at Virginia Tech. Before I knew it, I was in Blacksburg churning away on an incredible array of science with my sleeves rolled back and my mind eagerly anticipating what hypothesis we could ask next. Dr. Duchamp would visit approximately two days out of every week, and each time he spent an incredible amount of time getting me up to speed on what was going on in lab. **I say ‘incredible’ in retrospect, for throughout three more summers spent entirely in research, I have yet to have a mentor so dedicated to teaching.** In lab meetings, he listened to my ideas in earnest and always treated me with the respect that only someone with his level of scientific training deserved. After that summer, I knew that research had to be a part of my career.

I continued to work with Dr. Duchamp in the coming semesters as both student and research mentee. His positive attitude, incredible knowledge base, and acumen in conveying that knowledge never faltered. I am a better person because of Dr. Duchamp. The effort he has invested in not only me but all of his students is something that I will never forget. As mentee, co-author, and friend, I recommend Dr. Duchamp wholeheartedly for this award with no reservations.

Anthony Leonard (E&H Class of 2007), Medical University of South Carolina

I have known Jim for more than 8 years as a collaborator, a fellow scientist, and a friend. Over this time period, Jim has worked in my laboratory for several summers, jointly published several scholarly papers, helped mentor graduate students at VT and held joint short courses (VT/E&H). With Jim’s help we jointly held (Virginia Tech and Emory & Henry) an NSF funded Nanotechnology Undergraduate Education (NUE) “Hands-On” short-course for undergraduates in the Appalachian Region during the summers of 2004-05 ... Jim not only helped mentor my graduate students, but we also exchanged excellent students from Emory & Henry ... **As a result of this collaborative research a new endohedral metallofullerene compound was characterized and found to be 20 times more effective than commercially available contrast agents for increasing the relaxivity for *in vivo* and *in vitro* studies and is**

potentially a new nanoparticle for detection of malignant brain tumors ... I recommend without the slightest hesitation, Professor Jim Duchamp for the SCHEV Outstanding Faculty Award. He is an outstanding scholar, educator, and scientist and represents the very best in the Commonwealth.

Harry C. Dorn, Professor of Chemistry, Virginia Tech.

He maintains a scientific curiosity which is infectious to his students. During my Physical Chemistry laboratory course, Dr. Duchamp assigned small groups of students each to a laboratory topic and the students themselves researched and developed laboratories on their topic. The rest of the semester we rotated through each group's designed lab. This was a perfect way to learn the material and appreciate the complexities involved in laboratory work. What an eye-opener for students who were used to step-by-step canned labs! This course remains one of my favorites.

Dr. Jennifer H. Smith (E&H Class of 1998), Philip Morris USA, Richmond, VA

I look at Jim Duchamp's publication record, particularly in the last few years, and find it hard to believe that it's not the record of a full time scientist at a major university, teaching one course a year (with a grad student doing all the grading). That, instead, he's an outstanding teacher with a heavy teaching load, deeply involved in our community with considerable administrative duties makes that record all the more remarkable ... A catalyst is a chemical that, because of some fortuitous property, like its shape or its ability to form some intermediate compound, stimulates chemical reactions. Jim is a human catalyst. There's something in his personality, a restless energy, an inquisitiveness, a little bit of the busybody (in one of its more benign forms), an outsized sense of responsibility and commitment that seems to stimulate those around him into action. It's an unusual quality, and a valuable one.

Dr. Michael G. Duffy, Associate Professor of Physics, Emory & Henry College

Dr. Duchamp is an extraordinary professor due to his love and interest of chemistry, people and technology. **Not only does Dr. Duchamp challenge his students academically, but he also supports them and communicates with them regularly (often in creative and technologically advanced ways).** For example, I can remember countless AOL™ instant messages, in the evenings and on the weekends, with Dr. Duchamp as I worked through **Physical Chemistry problems my senior year** ... Recently I made a transition from teaching in the public school system to working for a large chemical company. Dr. Duchamp encouraged me while I taught, listened when I became frustrated and went above and beyond the call of duty when I began my career search. During my transition, Dr. Duchamp sent me countless e-mails with job opportunities and served as a reference for numerous jobs. Dr. Duchamp remained my advisor, mentor and friend even after my tuition payments to Emory & Henry stopped.

Roberta M. Frentz (E&H Class of 2003), R&D, Eastman Chemical

Chemistry is a "hands-on" endeavor and students learn by doing, not simply reading about some concept. Thus, I have always believed that true research must be a vital component of the undergraduate curriculum. Jim has a similar viewpoint and has actively involved undergraduate students in his research projects, both at Virginia Tech and at Emory & Henry. His projects are challenging and related to real-world problems and provide invaluable experience to these students.

Dr. Robert K. Boggess, Senior Research Scientist, Virginia Tech

Dr. Duchamp has compiled an enviable publication list. His work on fullerenes has appeared in peer-reviewed journals including *Nature*, in conference presentations, and in workshops for

colleagues. After joining the materials science group at Virginia Tech, he established a reputation among his peers not only as a viable research scientist but also as a leader of the group. Dr. Duchamp accomplished this despite the fact that his teaching load is much heavier than those of his university colleagues ... **For all his contributions to chemistry, Dr. Duchamp has not ignored service to the College. He has served on a variety of committees, including Teaching and Technology, Lyceum, Personnel, Admissions, and most recently, Faculty Advisory, which he chaired for one year.** It is well known that he is a technology guru who is frequently asked by his colleagues to solve tricky computer, software, and network problems. Dr. Duchamp created a science division server six years ago. This machine (along with some newer division servers) continues to be a reliable platform for a number of faculty who rely upon it for course web pages. He has been a key member of a grant writing team which has successfully written several substantial grants for instrumentation and curriculum.

Dr. James Warden, Associate Professor of Physics, Emory & Henry College

I returned to Emory after suffering a debilitating acquired brain injury and having gone through countless hours of rehabilitation at Shepherd Center Catastrophic Care Hospital. Many at Emory saw me only as a student with a disability, but Dr. Duchamp helped me to see myself as a student with promise and potential. **He devoted his time to prepare me academically and for life challenges. He believed in me when no one else (including me) did ...** In my opinion, Dr. Duchamp is a genius who has the ability to teach difficult material with great ease. He can take the most complex problem and teach it at a level of understanding. It is an impossible task to explain in one letter all he taught me.

Brandi N. Van Hoy (E&H Class of 2007)

Even before becoming chair of his department or division he was creatively generating ideas for improving the quality of the academic program in the sciences. He spent long hours brainstorming with other members of division, and then working with them to apply ideas that could best be carried out under the conditions of the college at the time. He organized an annual meeting in which faculty give short presentations to inform students about ongoing research. As chair of the Chemistry Department he added the option for one to three semester hour research experiences for underclass majors. Students doing these often do related senior level research projects.

Dr. George E. Treadwell, Jr., Professor Emeritus of Biology, Emory & Henry College

I have followed Jim's career since his arrival at Emory & Henry in 1994. His contributions to the program of the Chemistry department, the sciences, and the overall educational programs of the College have been outstanding. His collaboration with Prof. Dorn's group at Virginia Tech provides a model for the interaction of faculty and students from small liberal arts colleges with research groups in larger institutions ... **With his academic credentials, Professor Duchamp could have taken a position at numerous major research institutions. Instead he chose a career at a small, liberal arts college where he has successfully integrated his research with his teaching to provide the benefits of a teacher/scholar to his students.** His energy, enthusiasm, and dedication to the areas of teaching, research, and service make him an excellent candidate for the Outstanding Faculty Award. In my 45 years as an educator and professional chemist, he is one of the truly outstanding people I have known.

Frank A. Settle, Visiting Professor of Chemistry, Washington & Lee University

ADDITIONAL DOCUMENTATION

Dr. Duchamp by the Numbers

- Number of faculty promoted to full professor in the Natural Sciences at Emory & Henry College during the last 24 years: 1
- Number of peer-reviewed journal articles co-authored by Duchamp: 26
- Number of citations by others in articles: 674
- Number of book chapters co-authored by Duchamp: 3
- Number of patent applications with Duchamp as an inventor: 1
- Number of presentations co-authored by Duchamp: 29
- Number of months as an undergraduate student at Fourah Bay College, University of Sierra Leone, Freetown, Sierra Leone, West Africa: 5
- Average contacts hours taught per week by Duchamp: 17
- Number of meetings with explosive experts during the last 14 years by Duchamp: 1
- Number of advisees to MD/PhD programs: 2



“Cover molecules” synthesized by Professor Duchamp

From the student course evaluations...

Professor Duchamp's teaching evaluations reflect his enthusiasm with consistent comments about his making the student think and complaints about having online homework assignments due everyday (even weekends!) Many students also comment on how Professor Duchamp ties everyday life to chemical concepts being covered in class. His numerical course evaluations (1 = excellent – 5 = poor) average to 1.2 for “Evaluation of the Instructor Positive” and 1.3 for “Evaluation of Course Positive”.

Awards and Honors

James Earl Copenhaver Professorship in Chemistry, Emory & Henry College, 2003-present.

Appalachian College Association John B. Stephenson Fellowship for Faculty in the Arts & Sciences, awarded to facilitate collaboration with Professor Harry Dorn of Virginia Tech, Sabbatical leave 2001-2002.

Appalachian College Association John B. Stephenson Fellowship for Faculty in the Arts & Sciences, awarded to facilitate collaboration with Professor Harry Dorn of Virginia Tech, Summer 1999.

Travel Stipend to Gordon Conference on Magnetic Resonance, Chair's Fund, April, 1999.

Faculty Research Year, awarded by Emory & Henry College, 1998-1999.

Curriculum Development Grant, awarded by Emory & Henry College, 1998-1999.

Citation for Teaching Excellence, awarded by Emory & Henry College, 1997-1998.

Summer Research Fellowship with Kenneth B. Wiberg at Yale University, awarded by the Petroleum Research Fund, Summer 1997.

Summer Research Fellowship with Kenneth B. Wiberg at Yale University, awarded by the Petroleum Research Fund, Summer 1996.

Professional Development Grant, awarded by Emory & Henry College, Summer 1995.

Heyl Science Fellow, Yale University, 1987-1991.

Travel Stipend to 25th Congress Ampere (Stuttgart, West Germany) awarded by Department of Chemistry, Yale University, September 1990.

Travel Stipend to 29th Experimental NMR Conference (Asilomar, CA) awarded by ENC Committee, April, 1989.

A. M. Todd Chemistry Scholar, Kalamazoo College, Spring 1986.

Heyl Science Scholar, Kalamazoo College, 1983-1987.

Eagle Scout.

What Others Say: Creative and Caring

A Colleague

One cannot find a more talented and patient teacher. I have watched him interact with students in both the laboratory and in his office setting. He is approachable, kind, friendly, knowledgeable, and provides the kind of interactions that builds a climate of trust necessary for personal learning to take place. **When students are facing challenges, Dr. Duchamp creatively seeks methodologies to help each individual student succeed at his/her level.** This ability helps make the difficult subject of chemistry available to a wide array of students. He is also an advocate for the liberal arts and encourages his advisees to explore subjects that go beyond the sciences. Dr. Duchamp freely shares his talents with the entire campus community... Dr. Duchamp and his students are well known locally for "nitrogen ice cream" at community fairs, school visits, and church youth group activities ... He possesses a tremendous

understanding of computer technologies and has been instrumental in helping numerous faculty members integrate technology into their instructional programs.

Charles Goolsby, Professor of Art, Emory & Henry College

A Recent Graduate

In addition to his more traditional research, Dr. Duchamp has lots of ideas for using technology to streamline many everyday tasks that are done in the chemistry department and the college. As a work-study student, I worked on everything from a science department website to a chemical storeroom system to a college-wide calendar. I remember many days sitting in his office talking about new projects and the best way to introduce them in ways that would make them appealing to faculty and students. Dr. Duchamp also acts as the advisor for the E&H chapter of the Student Affiliates of the American Chemical Society. As chapter co-president for three years, I worked with him to organize educational, service and social functions for the group. Dr. Duchamp was always willing to help where we needed him, but he never tried to run the organization. For this I hold him in high regard; I have served on many committees and organizational boards before and since the ACS, and I have found no other faculty or administrative advisors who allowed the student organizations to be truly student operated. His hands-off approach allowed the organization to grow and change in ways it could not have had a more strict attitude been the rule ... His constant faith in his students and his boundless belief that each one is going to do great things in his or her life inspire many of them to continue their education after graduation in both graduate and professional schools. As a student in an MD/PhD program, I am an example of his effectiveness as a professor and as a mentor ... **Dr. Duchamp is somewhat infamous for his availability. My small physical chemistry class would often work on homework or study for tests together (which was encouraged!) near the chemistry wing of the science building. If we got stuck on a particularly difficult question, two or three of us would check his office and the nearby labs for Dr. Duchamp. More often than not we would find him there, no matter the hour, and he would come down to our study tables to help.** We always got more than a “use this equation.” Dr. Duchamp would explain the question and then relate it to a lab that a few of us had already completed. “You should be able to explain it!” he would remind us. With a little bit of leading, those that had done the lab usually could explain it, and then he would leave us to teach the concepts to each other. If he couldn’t be found in the chemistry wing, emails and even instant messages on AOL were sure to get quick responses.

*Acacia Lamb, Medical Scholars Program, Department of Biochemistry,
University of Illinois at Urbana-Champaign*