

The University of Maine
Colleges of Engineering
and Liberal Arts and Sciences

Are proud to Present

"The Physics of Subjective Reality"

*A retrospective of the remarkable career and personal perspectives
of master educator and physicist extraordinaire:*

DR. GERALD HARMON

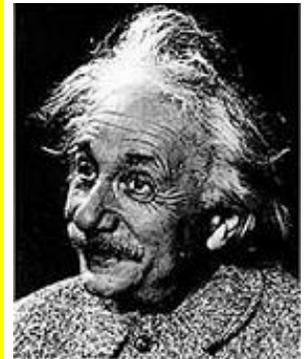


*"Learning is more
important than
Grades."*

Jerry Harmon

With a special overview of the
most important
equation at UMaine Physics from
1953-1997:

$$100 \log_{10} 10 \left(\frac{Score_{raw}}{Score_{max}} \right)$$



*"Imagination is more
important than
knowledge."*

Albert Einstein



Welcome to the Party!



We are extremely proud of the history of UMaine Engineering and the many accomplishments of our alumni. However, it is easy to overlook the fact that the success of our program is largely due to the hard work and dedication of our individual faculty members.

Five Years ago, UMaine Engineering began what has become one of our most enjoyable traditions. Every year during Homecoming weekend, we celebrate the career of a distinguished emeritus faculty member.

- 2000 – Mechanical Engineering - *Dick Hill Pajama Party*
- 2001 – Electrical Engineering - *Showtime with Mac Libbey*
- 2002 – Civil Engineering - *George Greenwood's Cowboy Roadshow*
- 2003 – Chemical engineering - *Bill Ceckler's Confessions of a Chemical Engineering Outdoorsman*

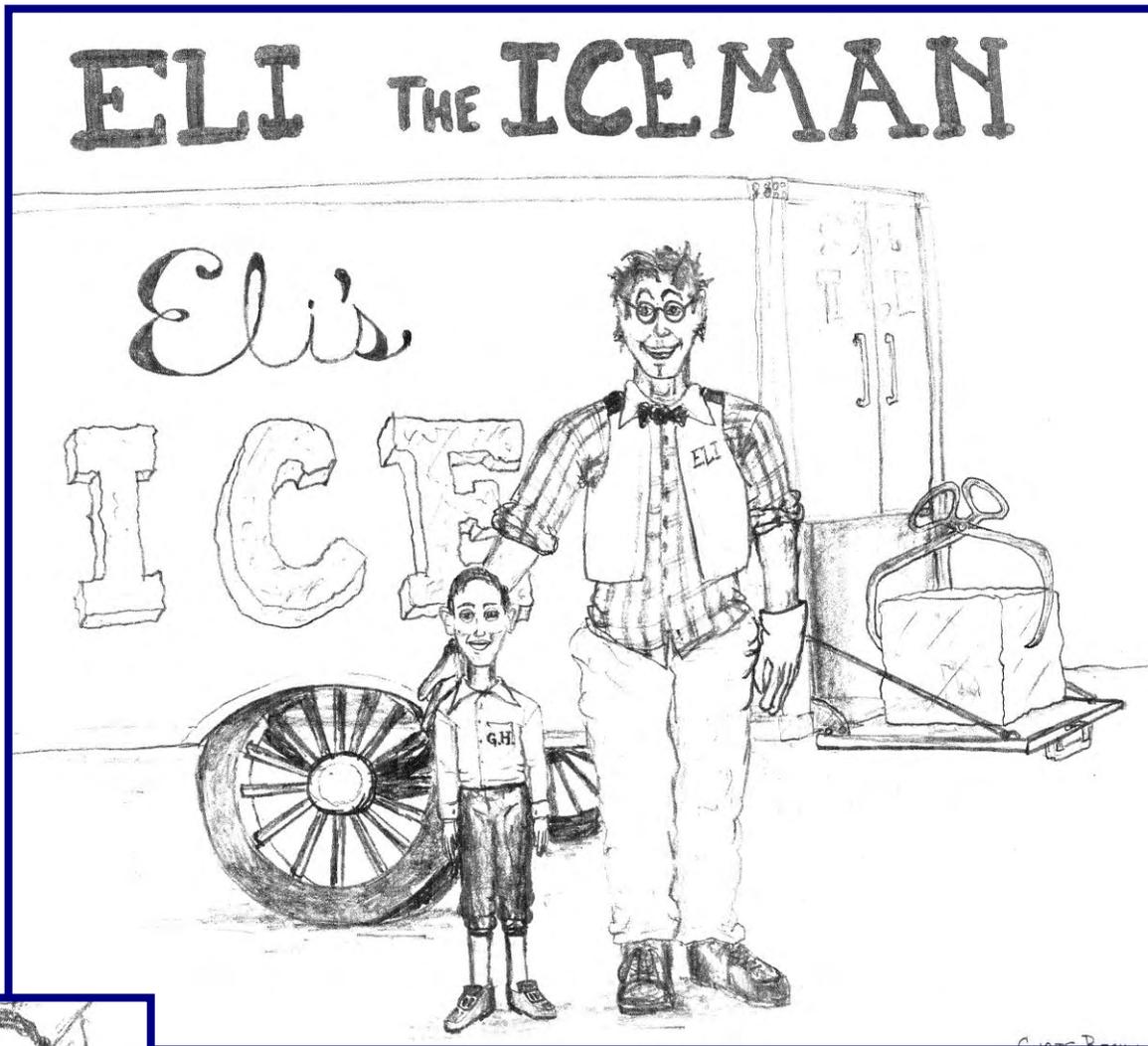
This year we are honored to add one of the Physics Department's finest, Prof. Jerry Harmon, to the ranks of our honorees. *The Physics of Subjective Reality* was chosen as a theme not because of Jerry's radical views on physics, but rather because of his passion for teaching physics. This is reflected in Jerry's own words; "*it is far more important for a student to understand physics 10 years after my class than it is for them to earn a perfect score at the time.*"

Every time I visit our alumni, I experience the true measure of Jerry Harmon's 44 years spent teaching physics at UMaine. His students have become project heads, university faculty, world-class researchers, and CEO's of major corporations. All of them credit their time at UMaine as a major factor in their success. Most importantly, all of our students remember their professors as a guiding influence that inspired them to reach their full potential in life.

We sincerely thank you for helping us to honor Jerry, and hope you enjoy the party!

Larryl Matthews,
Dean of Engineering

One Student's take on Prof. Gerry Harmon



A UMaine Engineering student drew this cartoon while he was taking Jerry's Electromagnetism Course.

It is based on the mnemonic Jerry used to explain the relationship between inductors and capacitors:

In the case of an inductor (L), the electric potential (E) leads the current (I); Thus "E" before "I" as in "ELI." In the case of a capacitor (C), the current (I) precedes the electric potential (E); Thus "I" before "E" as in "ICE."

Put the two concepts together, and you have the phrase "Eli the Iceman." Eli, of course, travels with a little helper that bears a striking resemblance to, and has the same initials as, Prof. Gerald Harmon.

When a student pays artistic tribute to your teaching methods... you are probably doing something right!



The Subjective Reality Grading System

By Dr. Jerry Harmon

I have been asked to explain the unique grading system I employed in the upper division course I taught in Electricity and Magnetism.

The test scores were obtained from the formula:

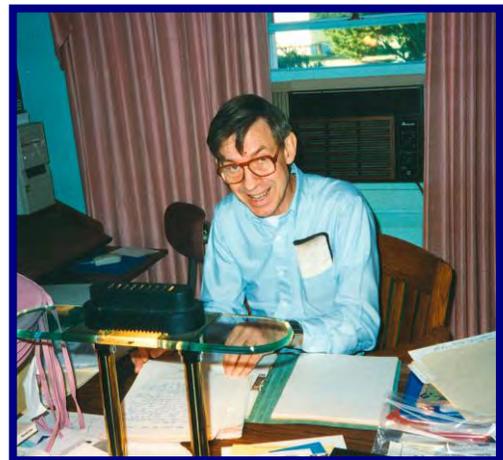
$$\text{Final Score} = 100 \log_{10} 10 \left(\frac{\text{Raw Score}}{\text{Max Score}} \right)$$

The system is nowhere sanctioned or condoned by anyone in the education establishment.

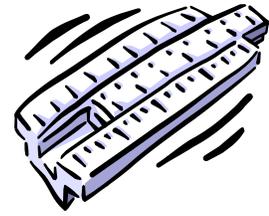
So, here is my defense.

For a number of years, I was concerned about the fact that, using the usual grading system, I had to make adjustments to the scores students were getting on my tests, in order for them to receive grades that I believed reflected their understanding of the material. These adjustments were clearly somewhat arbitrary, and not particularly consistent from one exam to the next.

One day I was grading a student's paper, with the result that he got 50% of the material correct, a potentially failing performance. I knew that he had started two problems in the wrong direction, and after spending a lot of time on them, had discovered his errors, corrected them, and was well on his way to getting them done correctly, but had run out of time. Clearly, a 50% grade did not reflect his understanding, and he should not fail. I judged that a 70% grade would have been more appropriate.



Back in olden times, we used slide rules. I happened to notice that the number 5 on the D scale lined up almost exactly with the 0.7 on the L (\log_{10}) scale. Furthermore, the number 1.0 on the D scale lined up exactly with the 1.0 on the L scale.



Aha! I had it. The formula above could be used, converting a 50% to a 70%, and a 100% to a 100%. (Of course, raw percentage scores less than 10 would give negative grades, but I never had students receive scores this low, anyway.)

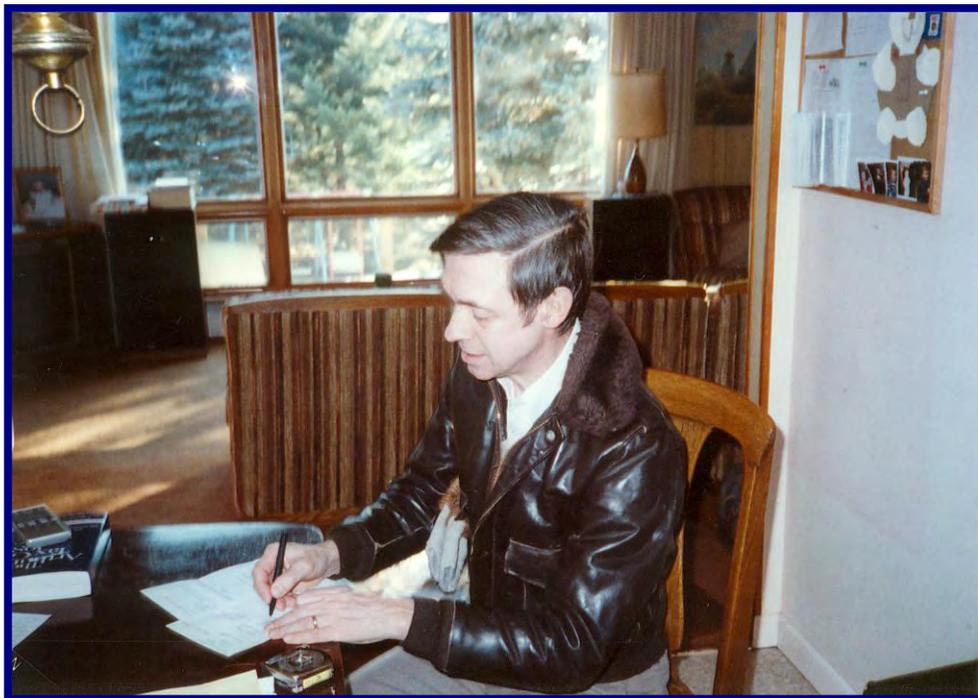
Now is there any other way to justify using this system, a poster?

Why yes!

If a student got going off on the wrong track, his or her difficulty in correcting it goes up pseudo-exponentially, and the grading system adjusts for this by being pseudo-logarithmic!

As I have said, the system is not sanctioned or condoned by the educational establishment, and I suspect it never will be. But it worked for me; students got grades that I subjectively believed were fair.

Also, I never got any complaints about it. Actually, I'm not sure they understood fully why I was using it.



Jerry Harmon



Professor Harmon is a great teacher and a good friend. I still remember the sophomore Intermediate Physics recitation session with Dr. Harmon, along with the Statistical Physics class senior year. Both of those classes were career-changing classes. I still recall the day Jerry came to the recitation class, and asked one of the students to put up one of the problems on the board. The student said that he hadn't gotten to that problem yet. Jerry moved to the next student who 'hadn't gotten to it' either. He went around to several more students and it was clear that most of us, myself included, 'hadn't gotten' to the problem. He picked up that very thick and heavy Halliday and Resnick book and slammed it down on the desk and exclaimed as he walked out of the room that we 'probably shouldn't bother to come back to the next class if

we didn't have all of the problems done'. We were all quite shocked at what we thought was an out-of-control professor. Of course, knowing what I know now, Jerry was very much in control and was doing exactly what was required. At the next class session, every student had every problem solved.

It was the Statistical Physics class senior year, when the lights started to go off in my head. Jerry worked intensely for that class, and though I had never had much interest in statistical things, I found it quite interesting and challenging. That class led to my interest in plasma physics and graduate school at Maine.

Of course the most significant experience was working more closely with Dr. Harmon as a graduate student. Friendships were formed with Ted Lautzenhiser, Gordon Mackenzie, and other graduate students in other areas. It also led eventually to an in depth study of a sputtering plasma at Gould Labs in Chicago that was used for the reactive sputter deposition of zero TCR films used in medical transducers. The magnetic separator developed there as a part of that project found its way into Secondary Ion

Microscopes that are widely used in surface science.

The early use of computer techniques in my graduate study with Jerry's and George Krueger's encouragement, back when we were barely out of mechanical calculators, led to my general interest in computer technology. This, in turn, led to a stint with Digital Equipment where I was able to work on the start-up there of thin film magnetic read write sliders for high density disc drives. Jerry's optimistic view of the world with his can do approach was very contagious.

His depth as an educator also had a profound impact on me. I still recall the last minute changes to my Doctoral Dissertation that were requested about 24 hours before the oral exam. It was an all-nighter and Jerry was right there with my wife Joy and me. I think we finished around midnight. The experiences at Maine enabled me to teach for 10 years at Olivet Nazarene College now University, and assist a number of students who later received PhDs in Physics at Wisconsin and Ohio State. Two of those students are now teaching at the undergraduate level. I served two terms as the Chairman of the Associated Colleges of the Chicago area. I also served two terms as the Society of Physics Students Faculty Councilor for Zone 9(Northern Illinois, Indiana, Wisconsin, Upper

Michigan). I am currently the Global Software Training Manager for Delphi, the world's leading automotive component supplier. We are currently processing more than 3,000 on-line quizzes each month with participants from Poland, Germany, France, England, India, Singapore, China, and Japan as well as the US. Since April of this year we have graduated 216 students.

I am grateful for the interdisciplinary nature of the graduate work that was supported by Jerry. He encouraged me to have an EE on my graduate committee. Jerry also encouraged us all to work closely with the staff. With his encouragement, I was able to build things using machine shop and glass blowing techniques developed at Maine. We learned how to function without much money. I remember fabricating a 6" vacuum system from a piece of Stainless Steel pipe we found down by the heating plant on Stillwater Avenue.

He illustrated by his own active family life that there are other very important pieces to life. I know that his camp on Little Jo Mary Lake up near Millinocket was special to the family. I remember coming by his house on occasion in Stillwater, and seeing the family swimming together. Dr. Harmon enjoys life and it is obvious to everyone around him. I

consider it a real privilege to be one of his graduates.

It has been a very long time since I have been back to UMO and I am looking forward to being with you.

Gordon Whitten, PhD

Class of 1965/68



I want to begin by saying what a pleasure it has been to have you as a colleague in the Department and to have worked with you on many projects. You took on the responsibility of doing the two hardest jobs in the Department – that of Graduate Student Coordinator, somewhat akin to herding cats, and teaching the most challenging upper division course sequence, Electricity and Magnetism I/II, PHY 454/455. The former involves assigning graduate student teaching responsibilities, managing each graduate students course load and carrying out all the many and varied tasks the department chair doesn't want to do, or

more-often-than-not, is totally incapable of doing. Thank you for all you have done to make the Department an excellent place to learn physics and teach physics.

It would not be difficult to recall several humorous stories appropriate for this occasion, but for me, one story stands out as epochal (definition: a particular period of time marked by a distinctive character or event.)

This story is known in the *Annals of Bennett Hall* as

DR. LEE: PLASMA GUY AND FISH HEAD SOUP

In the mid-1980's, the Department played host to a Professor of Physics from Harbin University, China. He was supported, the claim was made, by his government, to spend a year at an American university and by some form of circuitous reasoning, he picked the University of Maine. To make a long story short, he showed up on our doorstep with very little support, no place to stay and a battered suitcase containing one set of clothes. We eventually found someone to take him in, we brought food to the Department for him on a regular basis and we found him a winter coat, hat and boots. Once these important issues had been settled, Dr. Lee made his big announcement. Much to the relief of 14 of the 15 members

of the Department, Dr. Lee announced that he was a plasma physicist and that he had come to the University of Maine to work with the Honorable Dr. Harmon.

Dr. Lee's background as an industrial physicist was diametrically opposite to your academic and quantitative approach to plasma physics. The analogy that comes to mind is that between mud wrestling and ballet. You carried out elegant experiments in a glass vacuum changer, which you took great care to clean with esoteric solvents and acid rinses. Dr. Lee, on the other hand, proposed to use your vacuum system and plasma chamber to tan leather, extract sap from wood, or make cheese!

By the time he had completed his year with us, I think he had broken or burned-out every major piece of equipment in your lab. From my lab, being next to yours, I could tell, day in and day out, just what piece of equipment was being tortured, either from the buzzing and snapping sounds of electrical arcs or more likely, from the smells of burning high voltage transformers or rubber vacuum pump drive belts under unusual loads.

One evening, while working late, the air began to fill with a strong smell, something between that of a bait box full of worms that had been left out

in the sun all day and low tide down stream from a sewerage treatment plant. The first thought that crossed my mind was that somehow Dr. Lee had managed to get a dead fish into your plasma chamber and was in the process of turning up the r.f. power to see if he could make electronic sushi. I dashed across the hall, ready to pull the plug on the vacuum system when, much to my surprise, I discovered the system was turned off and Dr. Lee was hunched over a large aluminum pot on a hot plate precariously balanced on a smoldering wooden stool... I asked, "What are you doing?" The answer came back, "I cooking head fish soup". Upon quick examination, (I was holding my breath at this point,) I could see three fish heads bobbing in a rolling boil of gray-brown fluid. Part of the explanation that followed included the fact that Doug's Shop-n-Save actually throw away perfectly good fish heads and that if ... and I do not recall what came next, since I was out in the hall gasping for air, when the culinary details were presented.

Being Chair at the time, it fell to me to explain that it was against University policy to eat in the lab, let alone cook fish heads there, and that he could borrow the hot plate and take it home if he wanted ... and I added that I was absolutely sure this would meet the approval of Dr. Harmon. The

offer was seriously considered and in the end he agreed it was best not to cook in the laboratory, not because of safety issues, but because he would be able to prepare even more delightful meals in his bedroom now that he had use of a hot plate. I was offered a sample of the fish head soup, but respectfully declined ... in actual fact, the only thing I had on my mind was to rush home and take a shower.

Needless to say, Dr. Lee made a deep and lasting impression on the plasma physics lab and the people he worked with at the University of Maine.

About a year had passed after Dr. Lee had returned to China, when Jerry and I received letters of invitation to join him as research chairs in his plasma laboratory. I can't really say why Jerry declined this offer, perhaps he will tell you if you ask, but for me ... well, I really never liked fish chowder after that night in Jerry's lab, and since I hold nothing but kind thoughts for fish and other small animals, I thought I should bring this episode of the "Adventures of Dr. Lee: Plasma Guy and Electromagnetic Chef" to an end, with a kind but firm thank you, but no thank you.

Now if anyone ever wants Honorable Dr Harmon to serve on a committee, or write a program review report, or mow their law, or weed their garden,

all they have to do is contact me. For you see, I have Dr. Lee's address and a draft invitation on my hard drive ... and Jerry has a lot of room in his house and probably more than one hot plate.

Charles W. "Skip" Smith,
Colleague and Friend
UMaine Department of Physics



You were here before I arrived and, in the natural order of things, you will be here long after I'm gone. In between, you have been and continue to be, a comfortable colleague, easy to consult on matters of science and on matters of sensitivity. Your inherent kindness and steady good humor have contributed to this ease.

Long before I arrived, the Physics Department at the University of Maine, under the guidance of Clarence Bennett had developed a remarkably strong undergraduate program having high academic standards for the students, and

high expectations of the faculty. The department had also set up what I believe was the first accredited engineering physics curriculum in the country. It too was of top quality. This gave the department citizenship in both the College of Arts and Sciences and in the College of Engineering. As a product of that department, you inherited a devotion to quality teaching and concern for students which you have made cornerstones of your career. Many students of both curricula have gone forth proudly bearing the mark of Gerald Harmon.

When, shortly after I arrived, the College approved expanding the physics faculty, we as a department decided to use this expansion to give us a real presence in each of a number of basic physics areas, rather than focusing on one to the necessary neglect of the rest. You contributed to that goal by keeping up a vigorous presence in the field of high-temperature physics while Skip Smith established one in low-temperature physics next door. (In so far as I remember, we never yielded to the temptation to refer to this area of Bennett at the “Thermos Bottle.”) By its nature, experimental plasma physics almost always requires large laboratories with massive equipment and many participants. You have done a fine job all by yourself in keeping this important field alive in the State of Maine.

On the “somebody has to do it” jobs that plague a department, but are absolutely essential to its well-being, you have been most generous with your time, often serving as assistant department chairman and always (?) at the tedious job of Graduate Coordinator. We admire your hard work, and stubborn honesty that has contributed so much to the University, to colleagues and the departments.

Paul Camp

*Colleague and Friend
Professor Emeritus of Physics*



I have known Professor Harmon since he first began his faculty career in 1953. I was a freshman at Maine in 1952 and graduated with a degree in Engineering Physics in 1956. I believe I first became familiar with Jerry's talents as a teacher when I was a teaching assistant. I believe he was involved with the sessions we had each Saturday morning when we learned the in's and out's of the laboratory for the upcoming week. I do

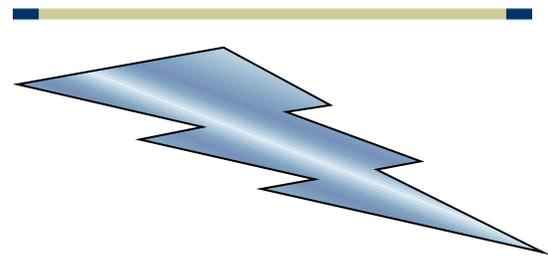
not believe I ever had Jerry for an instructor but I did run into him often while I was working on my senior project under the supervision of Jerry's close friend Dr. George Krueger.

When I returned to Maine as Chair of the Department of Physics in 1971, Jerry was still carrying on his duties as a member of the faculty with his unending enthusiasm. I always enjoyed my interactions with Jerry. He was always to the point in his discussions and anxious to solve the ordinary administrative problems quickly and then get on with his highest priority of working and guiding students. I will always carry the vision of Jerry dashing about and running up the north stairwell taking two steps at a time. While most of us aged and slowed down some he continued to walk at a pace that was one notch below a run! He is a real gentleman who loved his job working with students. He guided hundreds of students over the years. As Chair he was always supportive even when he would have taken a different path on an issue than I had taken. Everyone on the faculty admired Jerry and respected him as a person and as a devoted colleague.

I wish that I could be with you and Jerry's colleagues and friends on October 23 when he is honored for his years of devoted service to Maine. The

distance and commitments to some family issues here in the mountain southwest require that I be here at that time. However, I do hope to get back to Maine this academic year and hope I will have an opportunity to congratulate Jerry in person.

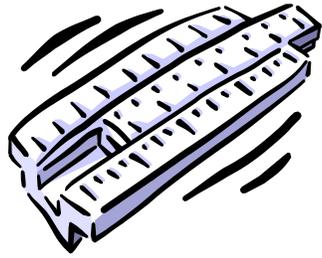
Henry O. Hooper, PhD
Class of 1956



Professor Harmon is one of the best teachers I've ever had. As an Engineering Physics major, I took "Freshman Physics" and the Electricity and Magnetism courses from him. He was always well organized and clear in his explanations. I greatly enjoyed his sense of humor as did most, if not all, of my classmates. An hour of his class time always flew by before you knew it.

I'm sorry I can't recall any specific entertaining stories for you, but please pass along my best regards to Professor Harmon. The world needs more teachers like him.

Jay A. St. Pierre
Class of 1992



When I learned that you are to be honored by UMaine Engineering and the College of Liberal Arts and Sciences this October I certainly wanted to include my personal thanks for being such a great mentor and positive influence in my life. Being unable to attend the celebration luncheon I hoped to be able to express my gratitude and sentiments through this letter. I would like to share several stories that I have carried with me over the years.

The first story was one that you shared with me and several other nervous first year physics teaching assistants that were about to embark on their first assignments. The story involved you and a lab student - a young UMaine football player that was falling ever more behind in his physics work. As you described him to us that day, this particular student was big, well over six and a half feet tall, and the kind of guy that is all muscles and has "no neck". You went on to tell us that you were anticipating the worst as he finally approached you one day while you were working in your office. Towering above you, you

were quite relieved when he said in a meek voice, "Gee Dr. Harmon, I'm at your mercy." This story was exactly the tension breaker that put my classmates and me at ease. I learned much from you that year about teaching - thank you!

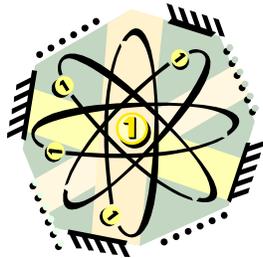
I have another story that I would like to share. This one involves a high school student attending the 1974 Boys State, a week-long summer program intended for young men to learn about politics and government (which was held at the University of Maine). Being rather bored with politics and Boys State stuff, one afternoon the student decided to wander through the basement of Bennett Hall looking for people doing more interesting things. He happened across (a slightly younger) Professor Gerry Harmon working on his plasma experiments. For the next hour the student was in heaven as Professor Harmon enthusiastically told him about his experiments and their relevance. The student had actually found someone that worked with electrons! This was the high point of the student's Boys State week and cemented his view that physics was the life for him. By the way, I have now been a practicing theoretical physicist for nearly three decades. Again I thank you, Gerry.

I close by saying that you have had an immeasurable impact

on many students over the last 44 years - I thank you for your mentoring, patience, kindness, and friendship.

My very highest regards to you.

Bradford Clements
Class of 1980/82



I am very pleased to submit a few words about Gerry Harmon on this special Homecoming Weekend at Orono.

It seems like just a short time ago that I arrived in Orono as a Graduate Assistant in Physics and a member of the Faculty of Arts and Sciences to boot in September 1955. Gerry was an Instructor at the time and a very approachable old pro. I remember walking thru the old screen door to the Department Office in Wingate Hall. Gerry was talking to the secretary Dot Landry who was planning to leave for another job. He introduced me and in the conversation that followed I was very impressed with Gerry's calm sense of humor and down to earth practicality. He and Chuck Packard clued me in on the inner workings of the department for the next two

years. There was no better way to learn the meaning of the traditions that played such an important role in the development of the Physics Department at the University of Maine!

William S. Penhallow
MS, Class of 1957

I acknowledge you for all of the great things that you did for our department during your many years of service.

Of course, I am a 'new guy on the block,' having arrived at Maine in 1988, so my memories of you do not go back all **that** far. However, I very much appreciated how you participated so strongly in the work and life of the department. I frequently heard from students (and still do hear from alumni) about the fine job you did in teaching your courses, especially E&M, and I particularly appreciate all the work you put into doing a careful job as coordinator of our graduate program. When I took over that job a few years after you retired, I loved how much your careful organization and record-keeping inspired me to do things similarly. Those great records also made the job of relating current graduate student-related activities to past-practice very easy for me. Thanks for ALL your great efforts!

Probably the event that stands out most clearly to me, however, came the day that you approached me in the hall, handed me a paperback book, and said, "I do not know how we can do it, but every student going to

UMaine should be required to take a course using a book like this!” The book was How to Think about Weird Things: Critical Thinking for a New Age. You said that you felt that one of the most important things a university can do for its students is to train them in thinking critically.

A couple of years later, as I was designing a First Year Seminar course under the auspices of the College of Liberal Arts and Sciences, I remembered that conversation and decided that the book would be good for my course: LAS 101 – “Extraterrestrials, Humans, and the Big Bang.” It seemed to work perfectly to spend the first half of the course learning about the many, many facets involved in thinking critically; such as deductive and inductive reasoning, evaluation of evidence and expert opinion, scientific methodology, and the nature and interpretation of reality; and THEN for the second half engage in discussion of the possibilities of life elsewhere in the universe (and reports of visits by UFOs, including abductions of earthlings). We had very lively discussions in class about how to think. The students were strongly engaged, and we all had fun in that course. I saw great changes in students’ thinking from the papers they wrote for the course and received

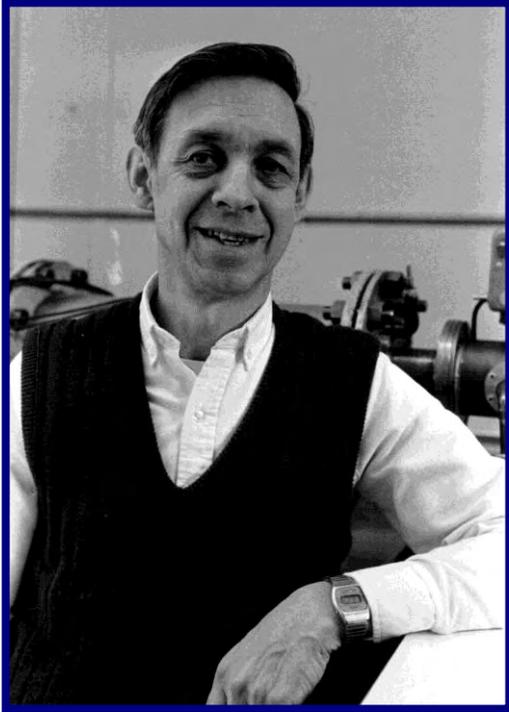
feedback from several students that they very much appreciated understanding what it was to think critically (and in one case, wishing that there were more critical thinking going on in some other courses). Your insight about the importance of the ideas in that book made quite a difference to my students.

From those experiences, I very strongly agree with you that the explicit teaching of critical thinking skills to all of our students is vitally important. I think it would be great if this was one of our General Education requirements. In fact, I am almost of a mind to say that we would be doing well to have critical thinking as the only GenEd requirement. Your recommendation of that book ten or twelve years ago has finally resulted in me being inspired to talk with our current dean about somehow creating a new learning opportunity here at UMaine, to explicitly look at how we think and what it is to think critically.

Thanks very much, Jerry, for that and all the other inspiration!!

David J. Batuski
Professor and Chair

Thank you Jerry



*For forty-four years you
taught generations of UMaine
students to the highest
standards of the profession.
Your service and dedication to
your students helped
establish the UMaine tradition
of excellence in engineering
and science that will continue
to guide and inspire us for
many years to come.*