Friday, April 1, 2011

Jon Rosner Symposium

"Jon the Educator"

Richard Robinett*
Department of Physics
Penn State University

From the conference web site:
"*In both areas, Jon is a distinguished and award-winning teacher.*"

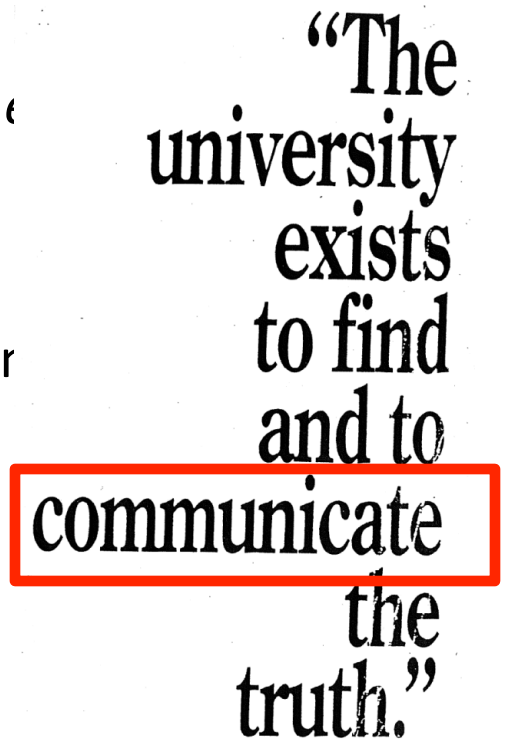
* Graduated from Minnesota (not Chicago) 1975, 1981

Why the focus on education?

- The following quote has been staring at me every day for 25 years since I became a professor – because I stuck it on my blackboard.
  - *"The University exists (only) to find and communicate the truth."*
  - I wanted to focus on, and honor, the 'communicate' part

- *"Education is what remains after one has forgotten e learned in school"*
  - A. Einstein (so says the web)

- This suggests **ALL** aspects of an educational experier
  - Classroom instruction
  - Pedagogical innovations
  - Research mentoring
  - Career preparation
  - Attitude, life skills, etc.



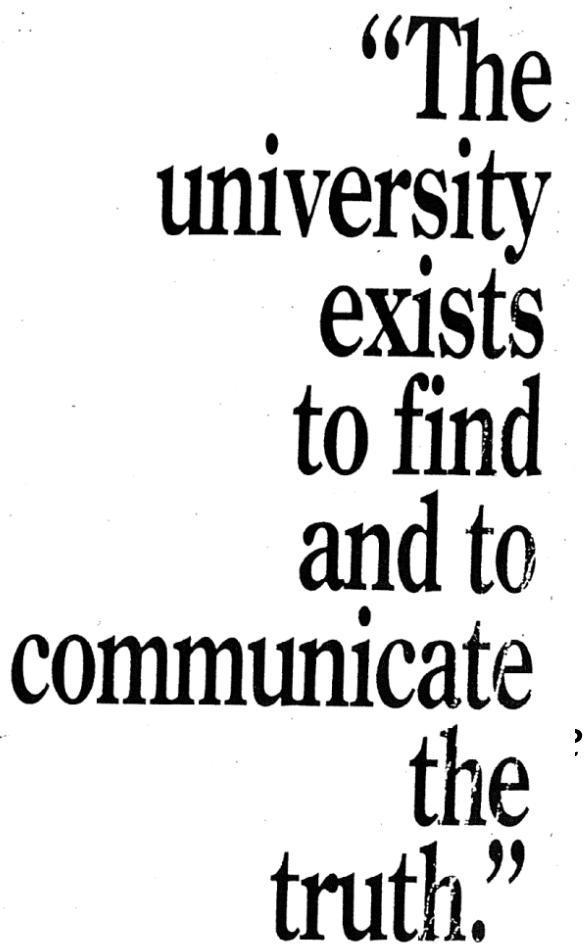
Musings on famous sayings

- *"The University exists (only) to find and communicate the truth."*
  - Who said that?
  - Robert Maynard Hutchins (1899 – 1977)
  - President University of Chicago (1929-1951)
  - What else is Hutchins known for?

- Great Books and Socratic dialog curriculum
  - Abandoned after he left – not all pedagogical i
- Abandoned the Big 10 and eliminated football

- Two more of his quotes, but of 'uncertain pro

- *"A student can win 12 letters at a University a one"*
- *"The three major administrative problems on students, athletics for the alumni, and parking*



Sources and approaches for this talk?
This talk versus other talks today?

- Personal reminiscences, anecdotes
- Random web sources
- Jon's CV and published papers
  - *"Who's that writin', Jon the educator"*
  - *"What's he writin', Jon the educator"*

Other talks today?

- Focused
- Single topic (monochromatic)

COHERENT

My talk?

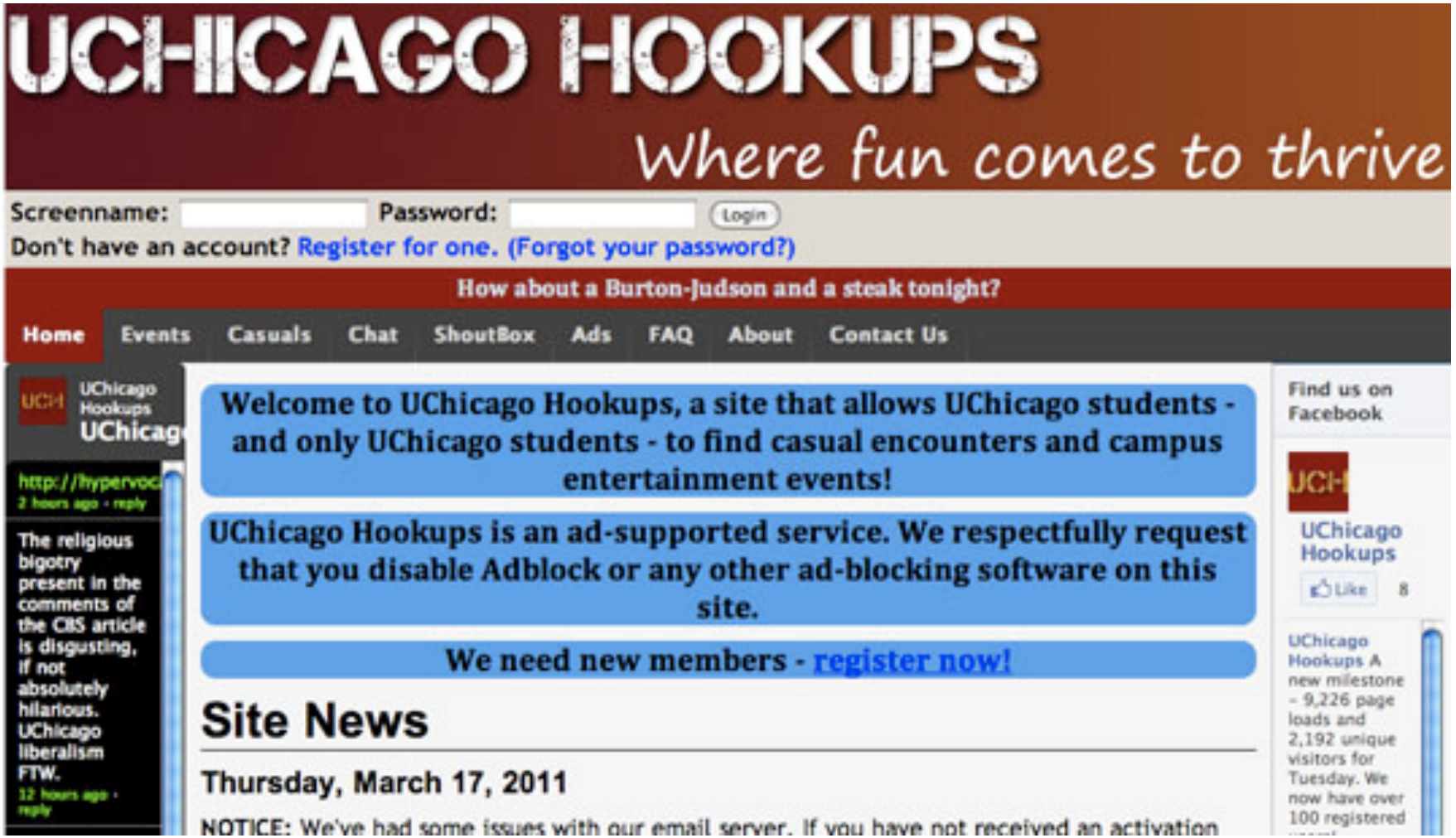
- Diffuse
- Many topics (broadband)

INCOHERENT

Once again, Chicago leads the way

or

Maybe Hutchins was right



Jon's 'hook ups' and 'progeny'

- Jon has had two long-term relationships
- 'Flings' (Cal Tech, IAS, CERN, FNAL, SLAC, Yukawa, CLNS)
- And 22 'children' along the way, with 2 'in utero'

5 Minnesota Ph. D.'s

17 Chicago Ph. D's. M. SC's and two on the way

Same dad, but two different mothers – lots of half siblings

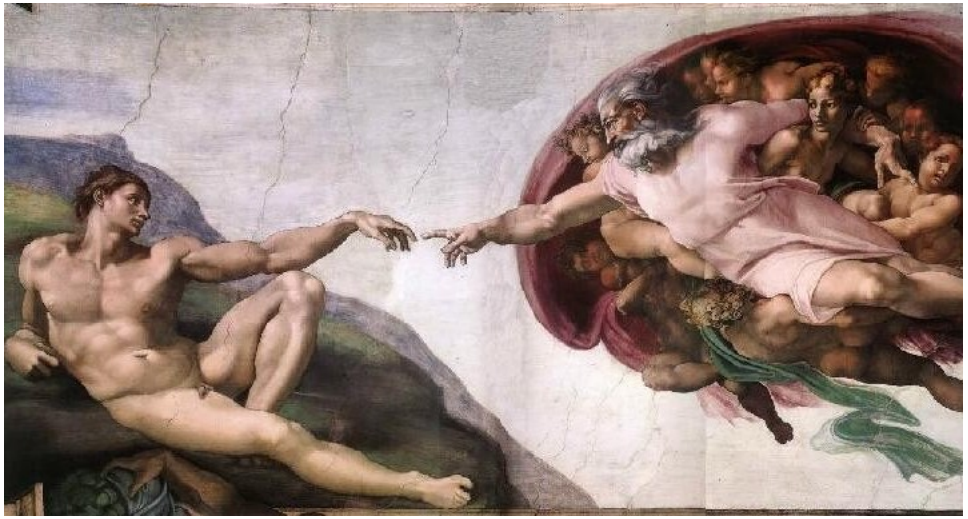
Minnesota days (at least one of them)

UM Physics faculty, staff, and grad students, ca. 1980

Where's Waldo?

Find Steve Gasiorowicz, Peter Moxhay and Jon Rosner

One student's view of a University of Minnesota Physics Ph. D.



Color chalk painting on blackboard in the UM Physics student lounge, ca. 1980

Jon has always had varied interests

- *"Temperature control in man and machine"*
- Jonathan Lincoln Rosner (Age 16) , Roosevelt High School , Tuckahoe, New York
- 1958 Westinghouse Science Talent Search

http://www.flickr.com/photos/societyforscience/sets/72157624917221952/show/
Has lots more photos, including ones of then Vice-President Richard Nixon in attendance

Do we always teach like we learned?

- Jon Rosner's early educational influences

Jon's own words on teaching

A student begins to apprehend material only when he or she can use it in a manner beyond that given in the lectures or the text. While the solution of exercises can be one such method, it is part of folklore that one only begins to understand a subject thoroughly when teaching it to others. Some methods of undergraduate instruction (such as the Swarthmore College Honors Program, with which the author has had experience) recognize this fact and make students responsible at an early stage for communicating information to their peers.

- "*Experimental projects in graduate theoretical physics courses*", JLR, Am. J. Phys, 1231-1236 (1996)

"*Experimental projects in graduate theoretical physics courses*", JLR, Am. J. Phys, 1231-1236 (1996)

- *"The instructor, having spent 10 weeks teaching the students, is ready to learn something from them as well."*
- *"An early push towards joint efforts thus serves as valuable training."*

Table I. Suggestions for projects in a first-year graduate classical mechanics course, University of Chicago, Fall Quarter 1994.

Topic	Reference
Compensated pendulum	Fetter-Walecka problem 3–10(c)
Hamilton as a forerunner of quantum mech.; classical limit of the Feynman path integral	See Goldstein, references in Ch. 9
Topics in chaos (e.g., Lyapunov exponents)	Gutzwiller (see syllabus); S. Hayes *et al.*, PRL 73, 1781
Accelerator physics	Fernow, *Intro. to Exptl. Part. Phys.* QC793.2.F470 (Crerar); Courant, Livingston and Snyder, Ann. Phys. 2 (1958)
Berry's phase and gravity	
Tidal equation	D. Müller *et al.*, PRL 73, 1557
Multi-body problems	
Lagrange points	I. Bialynicki *et al.*, PRL 73, 1777
Perihelion shift in a power-law potential	
Practical satellite tracking programs	See Instructor
The second variation (e.g., application to catenary)	G. A. Bliss, *Calculus of Variations* QA315.B58 (Eckart)

Suggested projects

Table III. Projects in classical mechanics, University of Chicago, Fall Quarter 1994.

Author(s)	Project title	Page
Miguel Barrio	Weird oscillating slab	1
Stephen T. Bright	Motion of an orbiting body in a uniformly rotating reference frame	11
Konstantin Gavrilov	The compensated pendulum	22
James A. Graham	Lagrange points	26
Matthew Knepley	The isochronous oscillator	39
Jordan Koss and Daniel Mueth	The period doubling route to chaos in an electronic circuit	51
Pat Krolak and Val Prasad	Satellite tracking: a practical approach to the classical two body problem	67
Donn MacMinn	Dynamics of the solar sail	95
Scott M. Oser	The Mathieu equation and stability of a driven undamped pendulum	103
Joseph Plewa	Pilot waves, beables, and the classical limit	116
Craig Wiegert	Lagrange equilibrium points in a logarithmic potential	124
Tong Zhou	Quasi-classical treatment of quantum mechanics problem	133

Actual student chosen topics

- *"…students are generally quite adept at choosing interesting topics on their own…"*

As if Jackson wasn't hard enough

'able II. Suggestions for projects in a first-year graduate course in classical electrodynamics, University of 'hicago, Spring Quarter 1995.

Topic	Reference
'hoton mass	E. Fischbach *et al.*, Phys. Rev. Lett. **73**, 514 (1994)
\ccelerator drift tubes	Book by Wideröe
'ocusing of particles in accelerators	Courant, Livingston, and Snyder, Ann. Phys. 2 (1958)
RF cavities for particle acceleration	Jackson, Ch. 13
'nergy losses in matter	
'araday rotation and polarization measurement in satellite signals	
RF pulse from cosmic ray air showers	H. R. Allan review article
'pectrum analysis techniques	
'chumann resonances	Jackson, p. 363
'erenkov radiation	Jackson, p. 638
Transition radiation	Jackson, p. 685
Rayleigh scattering	Jackson, p. 423
'assage of a high-energy particle through ionosphere	
Antenna impedance matching	W. N. Caron book (ARRL)
Antenna radiation patterns	ARRL Antenna Book;

Table IV. Projects in classical electrodynamics, University of Chicago, Spring Quarter 1995.

Author(s)	Project title	Page
Miguel Barrio	Non Linear Maxwell Equations	1
Stephen Bright and Daniel Mueth	Measurement of Temporal Correlations Between Individual Photons in Pseudothermal Light	12
Carlo Del Noce	Electrical Conductivity in a Magnetized Plasma	28
James A. Graham	Transition Radiation Detectors	38
Scott M. Oser	Charge-Asymmetric Corrections to the Bethe-Møller Energy Loss Formula	51
Valmiki Prasad	An Overview of the Fundamental Principles of the Physics of High Energy Particle Accelerators	63
Gordon Richards	Pulsars: The Aligned Rotator Model	74
Craig Wiegert	Schumann on a Shoestring: Searching for Resonances in the City	85
Y. N. Young	Multi-Fractal Behavior of the Spatial Distribution of the Magnetic Flux on the Solar Surface	96

Student chosen topics

The perils of being an experimentalist

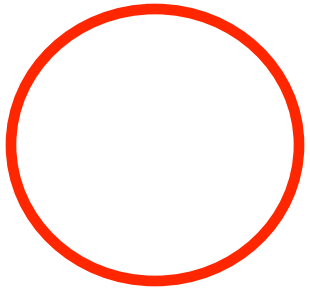
- One example of such a project comes from an electrodynamics course Rosner taught in spring 1991 in which one student constructed a magnetometer designed to be sensitive enough to detect solar flares by the changes in the earth's magnetic field.
- "Initial tests were discouraging," Rosner writes in a paper about his teaching that he plans to submit to the American Journal of Physics. "The instrument appeared to have three steady-state readings, flipping among them apparently at random."
- Then the student discovered that the signals came from a nearby elevator. Shortly after the equipment was moved to a better location, it registered a huge deflection, detecting a giant solar flare on June 4, 1991.

Graduate teaching at Chicago

- Not surprisingly, he won the 1996 *University of Chicago Faculty Award for Excellence in Graduate Teaching*
- "*I learned, understood and enjoyed more physics in [his] classes than in any other graduate course then or since*," wrote one former student in support of Rosner's nomination for the graduate teaching award. Another wrote, "*In a department known for its strong teaching, Jon stands out as a singularly dedicated and talented individual*." Other students cited his meticulous and thorough preparation for class, the quality and clarity of his lectures and the enthusiasm he brings to his subject.
- As this quote suggets, he's not the only good teacher. Other winners include Jeff Harvey, Robert Wald, David Schramm, and Robert Geroch

Personal experiences

- Grad particle physics course with Jon at Minnesota – everyone had to give talks
  - One student did the MIT bag model



- Collecting student research/review papers, having them bound and returning to students (like conference proceedings)
  - *"A key feature of these projects is to make the results available to the whole class*."
  - I shamelessly copied this when I taught jr/sr level courses.
  - That's how you judge if pedagogical papers work!

More quotes from Jon

- Quotes from this paper which say volumes about Jon's teaching.
- *"Final projects also permit the instructor to recall students as individuals rather than as members of a large class."*
  - Speaks to his obvious mentoring abilities
- *"Concrete projects can serve as reminders that one is after all dealing with a science whose foundations are experimental."*
  - Lots of us remember this emphasis on connections to experiment – more later.

More things I shamelessly used

Classical orbits in power-law potentials

Aaron K. Grant and Jonathan L. Rosner
Enrico Fermi Institute and Department of Physics, University of Chicago, Chicago, Illinois 60637

(Received 10 May 1993; accepted 11 November 1993)

The motion of bodies in power-law potentials of the form $V(r)=\lambda r^{\alpha}$ has been of interest ever since the time of Newton and Hooke. Aspects of the relation between powers α and $\bar{\alpha}$, where $(\alpha+2)(\bar{\alpha}+2)=4$, are derived for classical motion and the relation to the quantum-mechanical problem is given. An improvement on a previous expression for the WKB quantization condition for nonzero orbital angular momenta is obtained. Relations with previous treatments, such as those of Newton, Bertrand, Bohlin, Fauré, and Arnold, are noted, and a brief survey of the literature on the problem over more than three centuries is given.

- Nice connections between classical and quantum solutions
- I used it as a testbed for a `Mathematica in Physics' class to do numerical integration of ODE's

Review articles for AJP

- "Resource letter NP-1: New particles", JLR, Am. J. Phys. **48**, 90-103 (1980).

- "Hadron spectra and quarks", S. Gasiorowicz and JLR, Am. J. Phys. **49**, 954-984 (1981)

- "Resource letter SM-1: The standard model and beyond", JLR, Am. J. Phys. **71**, 302-318 (2002).

Classical analogs of particle effects

Classical illustrations of *CP* violation in kaon decays

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(Received 10 January 2000; accepted 31 March 2000)

It is easy to construct classical two-state systems illustrating the behavior of the short-lived and long-lived neutral K mesons in the limit of CP conservation. The emulation of CP violation is more tricky, but is provided by the two-dimensional motion of a Foucault pendulum. Analogies are drawn between the pendulum and observables in neutral kaon decays. An emulation of CP and CPT violation using electric circuits is also discussed.
[DOI: 10.1119/1.1289212]

Tabletop time-reversal violation

Jonathan L. Rosner
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(Received 2 October 1995; accepted 5 January 1996)

Many electrical and mechanical systems with two normal modes are appropriate for illustrating the quantum mechanics of neutral kaons. The illustration of CP- or time-reversal violation in the neutral kaon system by mechanical or electrical analogues is more subtle. Some possibilities which could be realized in a tabletop demonstration are suggested.

Jon Rosner the 'quantum mechanic'

- What I got when Googling 'rosner' and 'quantum'
- Jonathan Rosner, Vice President, Corporate Finance at **QuantumWave** Capital

- My interest in quantum mechanics
  - Steve Gasiorowicz (modern physics)
  - Ed Tang (jr/sr level quantum mechanics)
  - Jon Rosner (applications of quantum mechanics to quarkonia – real life applications happening *NOW*)

The Smith chart and quantum mechanics

Jonathan L. Rosner
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(Received 10 February; accepted 26 September 1992)

The Schrödinger equation and the equation describing the behavior of voltage on a transmission line are both linear second-order equations, which may be solved by convenient matrix methods. By drawing analogies between these two problems, it is shown that a method used for antenna impedance matching based on the Smith chart corresponds in quantum mechanics to a simple conformal transformation of the logarithmic derivative of the wave function. One thereby can arrive at an elementary derivation of the Wentzel–Kramers–Brillouin quantization condition.

Quantum mechanics and electronics

Nice visualizations using complex numbers (basically an Argand diagram)

We (PSU) have lots of EE majors doing minors with us, using QM as a ‘statistics elective’

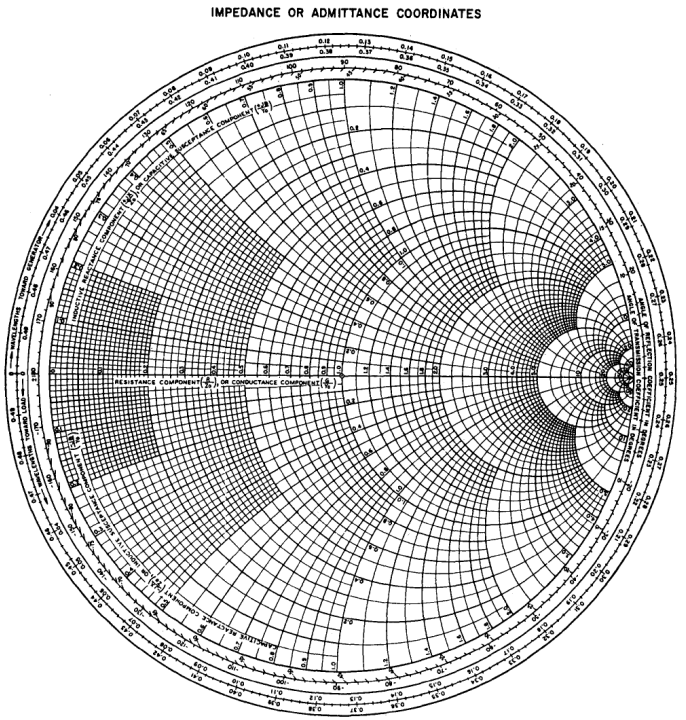

Fig. 3. A Smith chart (Ref. 6). Contours are those of constant resistive and reactive components of normalized impedance. Note that the chart uses the convention $j=-i$, so $Z_L=j\omega L$ and $Z_c=-j/(\omega C)$.

Personal memories

- "*Education is what remains after one has forgotten everything one learned in school*"
- Noting the date and numbering each new page of 'theory notes'
  - I'd only seen experimentalist do this – due diligence and care
- Comment as he left the pizza and beer party my soccer team mates and friends threw me the day I passed my Ph. D. exam
  - "*Remember, we still have fish to fry*" – just the start of a career
- One can always ask for help or advice
  - "Let's go ask Ed Witten, he's just down the hall"
- Letters of recommendation, mentoring, career help
  - I now spend LOTS of my time doing this. Still feel like I'm paying back all that my professors, mentors, etc. have done.

Education in the most general sense

- Classroom instruction
- Pedagogical innovations
- Research mentoring
- Career preparation

- Jon has done them all well!

Similar comments from another Minnesota student

- "*Jon has been a great mentor and a good friend. As a graduate student, it was heartwarming to feel welcome to his office as well as his home. An important lesson I learned from Jon was to connect theory with firm experimental evidence. His allowing me the freedom and independence to find and develop my own research interests helped prepare me for and shape my physics career in a very positive way*."
- C. N. (Terry) Leung – U. Delaware
- Terry sends best wishes on Jon's retirement!

Comments from a Chicago student

- The older I get the more I find myself, sometimes consciously and sometimes not, emulating Jon when I advise students. I learned a lot of physics of course -- including especially his attitude as a big fan of experiments -- but some of the most important lessons were a result of his wisdom and warmth. I am surprised to discover that I'm now a bit older than Jon was when I was his student. I can't say I feel I've achieved the level of wisdom he had then, but I do my best to emulate his example.

  Some random examples:

  1. There are phases students go through which are good for them but which they grow out of. But it's up to the student to work through it him/herself. The example is physics problems that excite smart youngsters and can be fun and useful exercises but that ultimately are destined not to go anywhere. It's no use trying to convince the students they're wasting their time; they have to figure that out for themselves.

  I remember being very excited about one such problem and going to Jon with it. He gently made it clear he wasn't interested in getting involved, while leaving it open for me to pursue if I wanted to. So now when students come to me with these problems, although I'm thinking "Oh no, here we go again" and I'm inclined to be dismissive, I try to respond more like Jon did.

More comments (cont'd)

- 2. When it came to career advice, Jon was a huge resource for me, because he had some not-so-obvious suggestions that I would never have thought of and which were very helpful. This was especially useful in my case as I tried to coordinate my academic career with my husband's. Jon was especially sensitive to my situation and without his advice and support I would not have been able to make things work out as well as they have. Now I try to **pay it forward** with students and let them know there may be more options than they think.

  3. Jon always encouraged his graduate students to pursue their own interests in their research, without treating us as the hired help or simply means to advance his own research program. When I worked with Jon I was typically one of about four of his Ph.D. students, and we worked on an impressive variety of problems. Now I try to help my own grad students figure out what interests them most, rather than simply assigning specific projects.

Lynne Orr
C. E. Mees Professor of Physics
University of Rochester

Last subject, congratulations!

- **Results of 2010 DPF elections**

- Via Chip Brock - Michigan State University, DPF chair
- *"I'm pleased to announce the results of the 2010 DPF election as follows:*
- *Jon Rosner of the University of Chicago has been elected Vice-Chair.*
- *Jonathan Feng of University of California, Irvine and Lynne Orr of the University of Rochester have been elected members of the DPF Executive Committee."*
  - **Kudos , ½ sis!**

In conclusion, many thanks…

- …to Jon L. Rosner (the Educator)…for his heroic efforts in all of these areas…
- …and since all superheroes have an alter ego…
- …best wishes to WO9S as well!