



# *Physics Careers in US Academia*

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- + THE “problem”*
- + Working toward a solution...*
- + Working in American Higher Ed.*
- + Improving your chances 4 an interview/job ...*





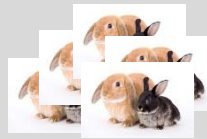




# Problem Solution Working Impr



- ⊕ *Lots of PhD-granting institutions (here and abroad!)*
- ⊕ *Based on APS 2014 data (latest available):*
  - ⊕ *there are ~200 PhD level Univ. in the US (~50 M)*
  - ⊕ *produced **1803** PhDs (870 Master)*
- ⊕ *Assuming 30 faculty/R1 dept. ~**6000** faculty\**
- ⊕ *so every **3-4** years ...*
- ⊕ *The “lifetime” of an University prof. is 25++!!!*



- ⊕ *did not even mention foreign institutions*
- ⊕ *or “competing” fields astronomy\*, materials, eng.*



# Problem Solution Working Impr



- ⊕ *Clearly not realistic that all the newly minted PhDs will be absorbed into R1s!*
- ⊕ *Some have started arguing that the production of degrees is too large*
- ⊕ *The reality is of course different... **RAGS-RAC5***

⊕ *My \$0.02: less plug-and-play PhDs - more employable PhDs*

- ⊕ *“Knowledge will forever govern ignorance;*
- ⊕ *and a people who mean to be their own*
- ⊕ *governors must arm themselves with the*
- ⊕ *power which knowledge gives.”*

⊕ *James Madison*





*Problem Solution Working Improving*

# *Working towards a solution:*

## *1. Acknowledging that there is a problem*



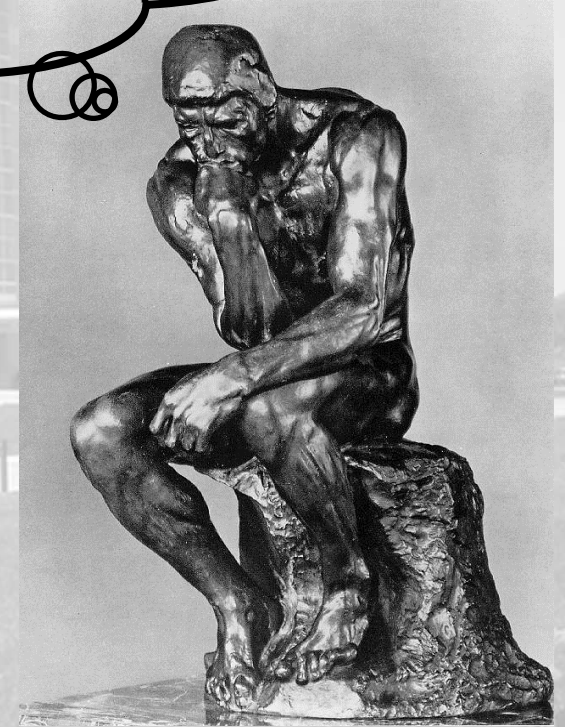
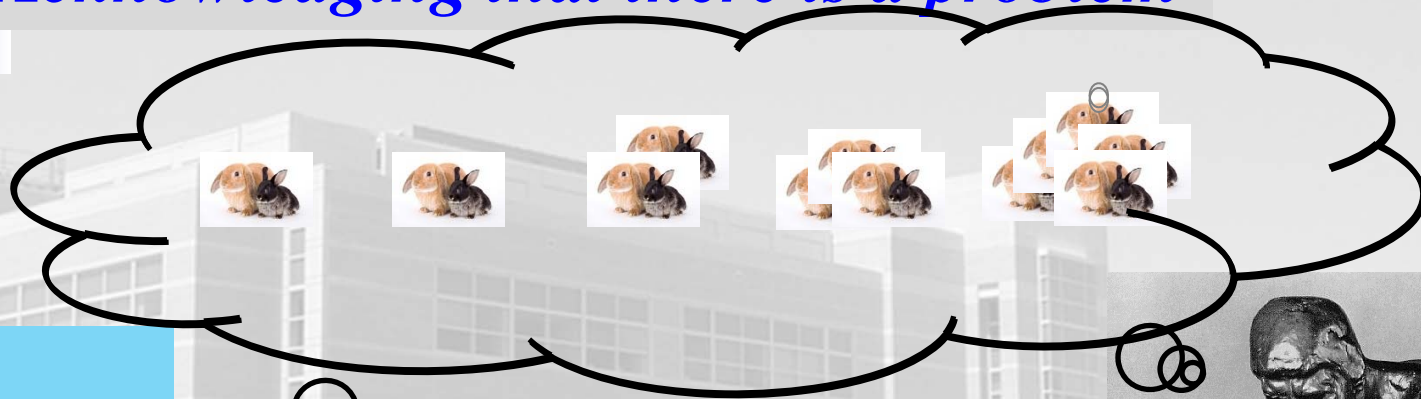
2016, JLab



*Problem Solution Working Improving*

# *Working towards a solution:*

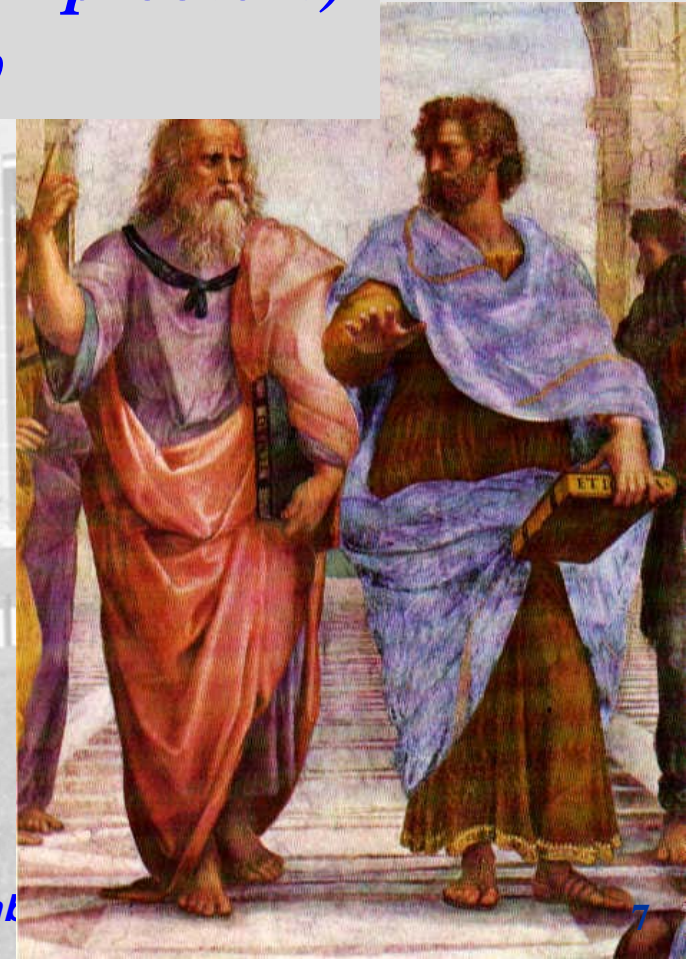
## *1. Acknowledging that there is a problem*



# *Working towards a solution:*

- 1. Acknowledging that there is a problem*
- 2. More openness (as far as "THE" problem) in the adviser-student relationship*

*(postdoc)*







# Problem Solution Working



- 1. Acknowledging that there is a problem*
- 2. More openness (as far as “THE” problem) in the adviser-student relationship*
- 3. More preparation/emphasis toward possible “alternative” careers*
  - skill set*
  - application writing*
  - interview preparation*





# *Problem Solution Working Improving In the US Higher Ed. System...*



*(if you're foreign-based pay attention!)*

- ⊕ there are ~200 PhD level Univ. in the US...*
- ⊕ In addition to that, based on APS 2014 data:*
- ⊕ 540 Bachelor level Universities (PUI)*
- ⊕ Assume an avg. of 8 faculty per ~ 4000\**
- ⊕ That's 2/3 of the # of positions @ R1s!*
- ⊕ It will not solve the overall problem but it might be part of the solution!*





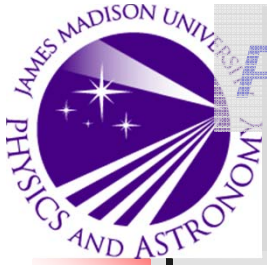
*Problem Solution Working Improving*



## *Working at a US University...*

- ⊕ *Is US higher-ed “work” is a three-legged stool:*
  - ⊕ *Teaching* (advice here!)
  - ⊕ *Research* (advice here!)
  - ⊕ *Service* (advice here!)
- ⊕ *The balance between these is different from school2school*
- ⊕ *@JMU is roughly):40/40/20\**





# Problem Solution Working Improv

## Workload



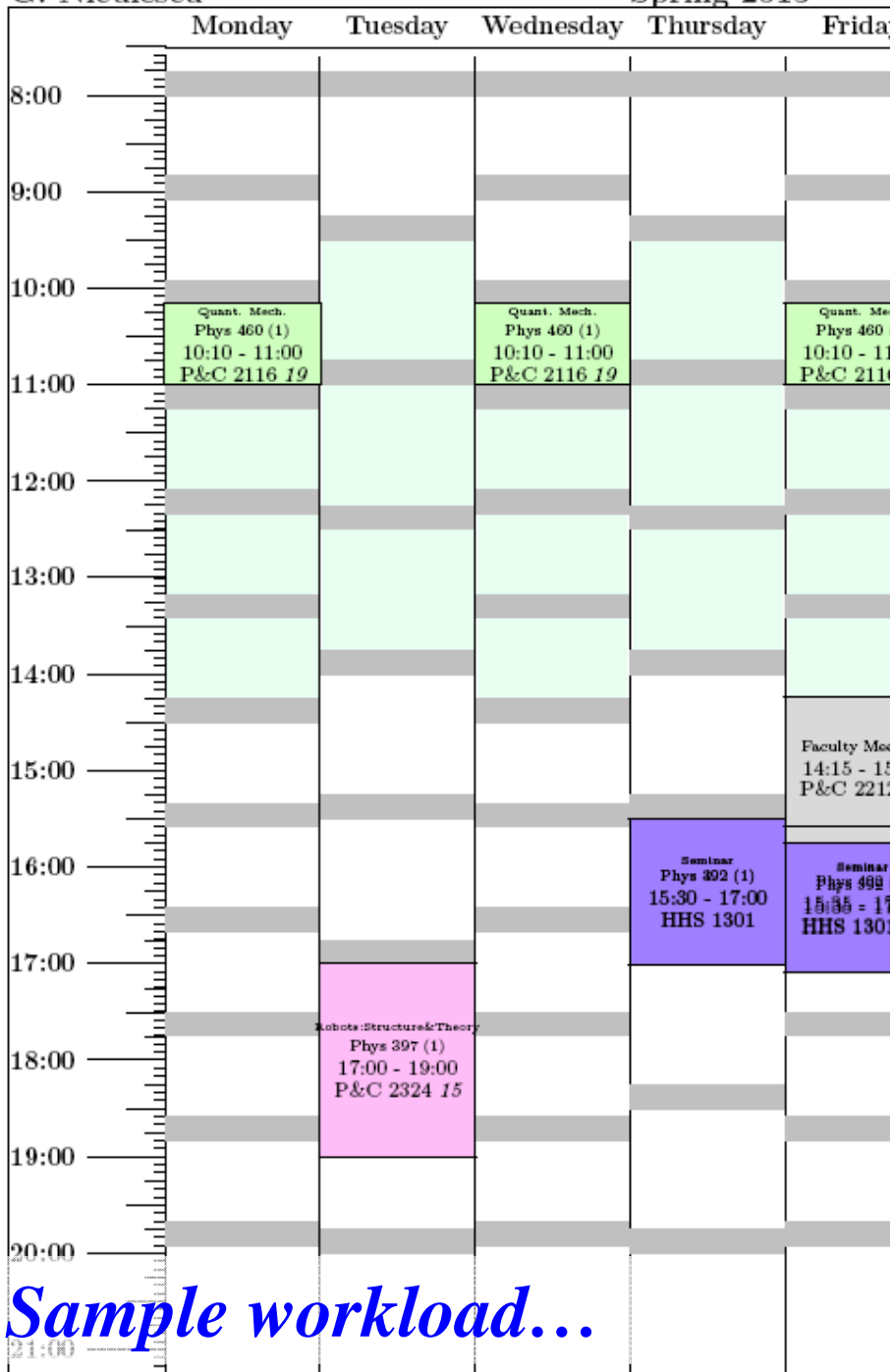
- ⊕ *Expect a heavy(er) teaching load @PUIs vs RIs*
- ⊕ *How heavy depends on several factors:*
- ⊕ *Size of the University, size of the dept., grants, etc.*
- ⊕ *I've seen up to 5 classes\*/week*
- ⊕ *I will show you my schedule 4 the year – it is not typical!*





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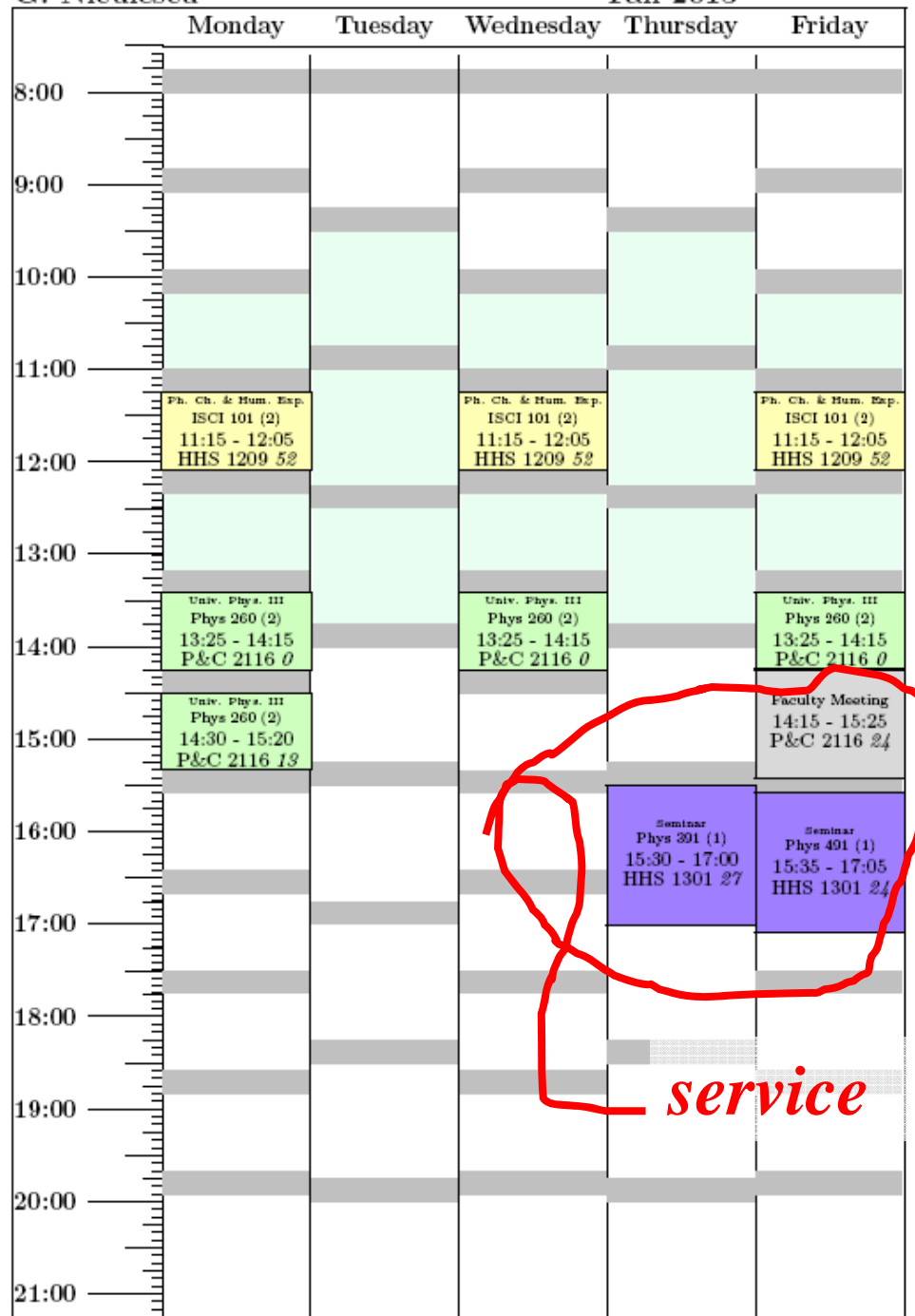
Spring 2015



*Sample workload...*

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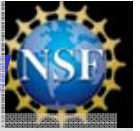
Fall 2015



*service*



# *Problem Solution Working Improving* **Balancing Teaching & Research**



- ⊕ *By far the hardest act U need 2 master\**
- ⊕ *(Re)calibrate: ID your long-term research goals.*
- ⊕ *Do these match your institution's requirements??*
- ⊕ *Take on projects you reasonably hope to complete (timely).*
- ⊕ *If successful expect envy & resentment from fellow faculty...*
  
- ⊕ *Advice: Many top-tier R1s higher a lot more TT people than they expect to tenure!!!*



## *Balancing Teaching & Research*

- ⊕ *H8 to toot my own horn but...*
- ⊕ *the Particle and Nuclear Physics @ JMU (KG, IN, GN) in the past 11 years:*
  - ⊕ *80+ students*
  - ⊕ *~2.5e6+ \$\$ in grants (NSF, SCHEV)*
  - ⊕ *Publications (150+), Awards (3)*
  - ⊕ *Print, radio, TV coverage, interviews, etc.*
  - ⊕ *Finished/ongoing projects @ FNAL, PSI, JLAB*
  - ⊕ *Lots of students (~60) that went on into promising careers*
  - ⊕ *Q: How do you measure success?*

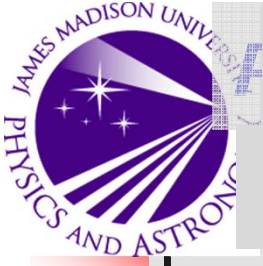






## *Improving your chances for an Interview*

- ⊕ *Taylor your application to the school...*
- ⊕ *If you think you can apply with same material/skill set emphasis everywhere – **THINK AGAIN!***
- ⊕ *Here is what not to do: [applic\\_gabriel\\_template.pdf](#)*
- ⊕ *“that” landed me exactly 0 (zero) interviews*
  
- ⊕ *The CV is NOT the only thing you need to work on!*
- ⊕ *Cover letter!*
- ⊕ *Teaching statement! (especially but not only @ PUI)*
  
- ⊕ *#s: Focus Search: ~50, Field Search: ~100+, Open Search: 300+*



# *Problem Solution Working Improving*

## *So what can a person do?*



- ⊕ Go and teach (as an adjoint) at one of the local schools*
- ⊕ If teaching is something that you do not enjoy/stand then why bother applying?*
- ⊕ Do not assume that you will only be asked to teach grad. level classes!*
- ⊕ Make sure that this experience is (prominently) featured in your application AND in your phone & in-person interview*
- ⊕ Get familiar with some of the modern teaching techniques and be prepared to field questions about them...*



# *Problem Solution Working Improving* *So what can a person do?*



- ⊕ *If competing for a **focused, R1 position** ...*
- ⊕ *Is the position already spoken for?*
- ⊕ *Emphasize how **YOU** will enhance/improve the capabilities of the group (if existing)*
- ⊕ *... or how you will establish a new (sub)group based on your (established and exiting) research program*
- ⊕ *You did develop one, didn't you?*
- ⊕ ***Advice:** Ask for “development time” to work on your own projects when signing on for postdoc!*





## *Problem Solution Working Improving*

# *So what can a person do?*



- ⊕ *If competing for an **Open Search/PUI...***
- ⊕ *Be aware of institutional biases against our field – be prepared to counteract them (best defense...)*
- ⊕ *Most faculty (including deans and the like) think that N-P physics **ONLY** happens @ big, national labs.*
- ⊕ *Explain how you will involve students in your research **ON CAMPUS**, what good/useful experience they will get...*
- ⊕ *Explain how your relationship with a Nat.Lab. will benefit the school*
- ⊕ *Think very hard b4 offering the undergraduate students to do “data analysis”!!!*



# *Problem Solution Working Improving*

## *So what can a person do?*



- ⊕ *In both cases...*
- ⊕ *Taylor your presentation to the audience\*:*
  - ⊕ *Make your presentation appeal to both the faculty and the students in the audience*
  - ⊕ *Enough high level stuff to have the faculty impressed*
  - ⊕ *... but not too much so that you lose the students\**
  - ⊕ *Spend a good time (at the beginning) painting the “big picture” and then introducing how your particular interests fit into that picture. (captatio benevolentiae)*



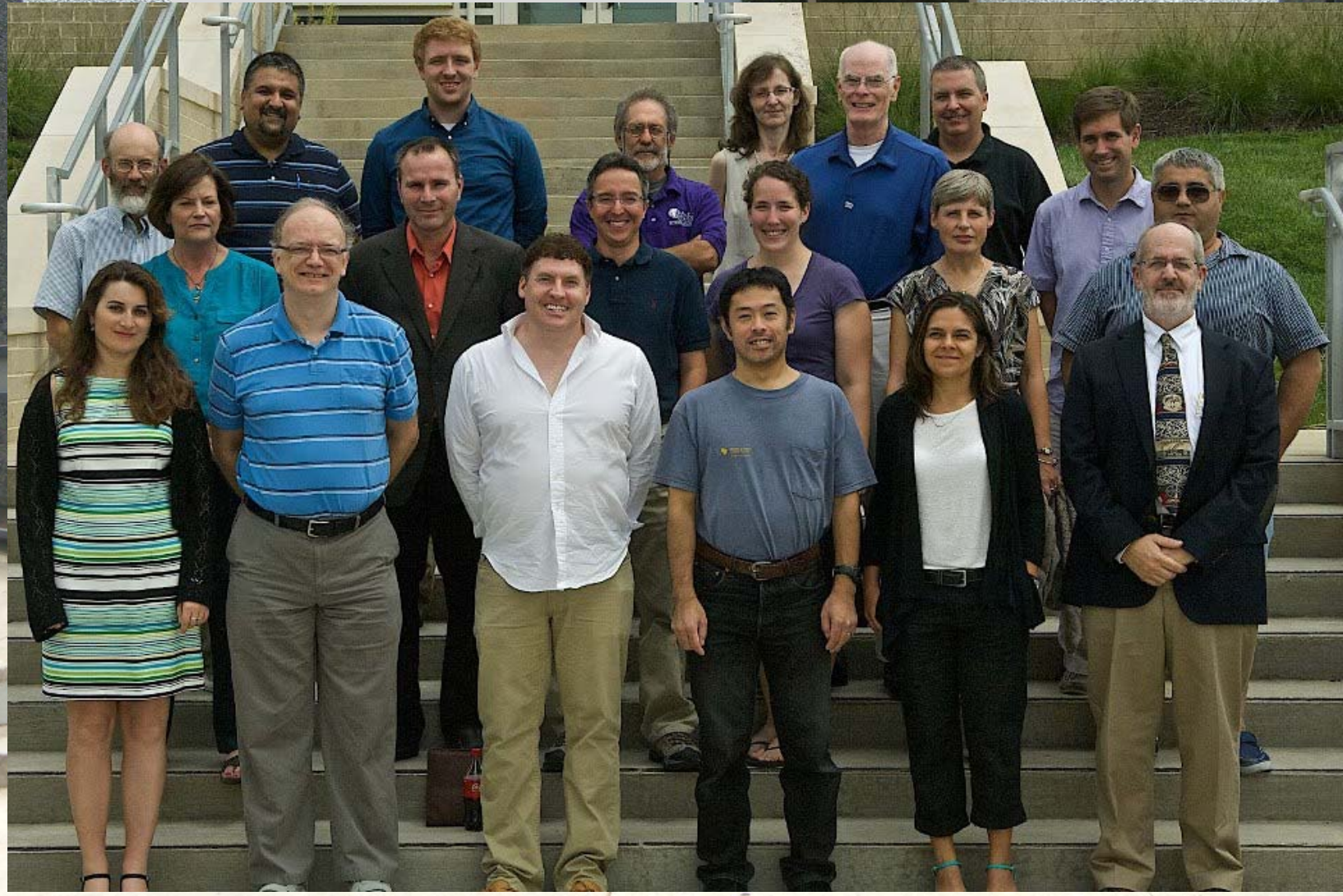
# *Problem Solution Working Improving (Instead of) Conclusion*



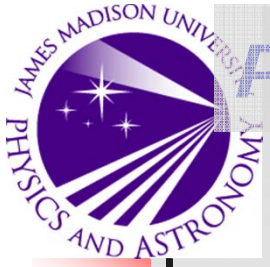
- ⊕ *Teaching at a US University/College might be a **good/rewarding career choice***
- ⊕ *You will continue pursuing your **research...***
- ⊕ *... as well as (possibly) your other “interests”*
- ⊕ *Note: PUIs tend to be “family-friendly” than RUIs.*
  
- ⊕ *Competition is substantial – so prepare yourself*
- ⊕ *You are the smartest, most qualified person in that applicant pool!*
- ⊕ *You just need to convince the Search Committee of that!*



***GOOD LUCK!***







*Problem Solution Working Improving*



***GOOD LUCK!***





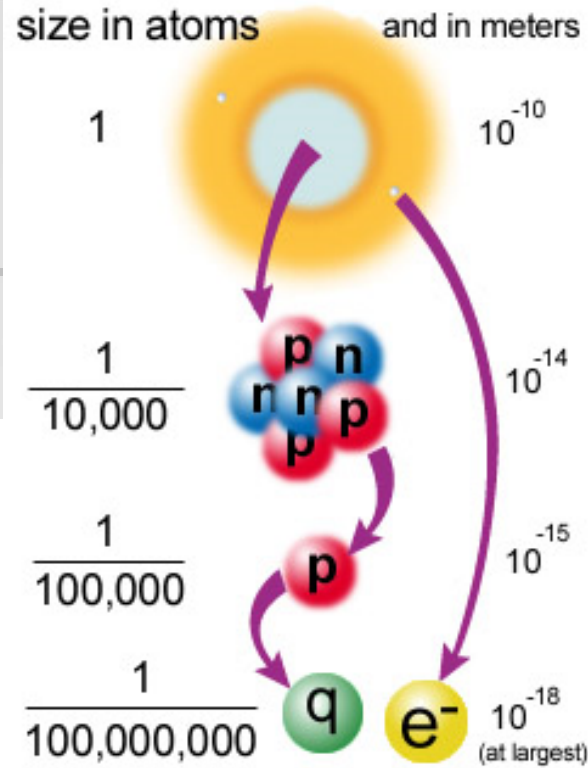
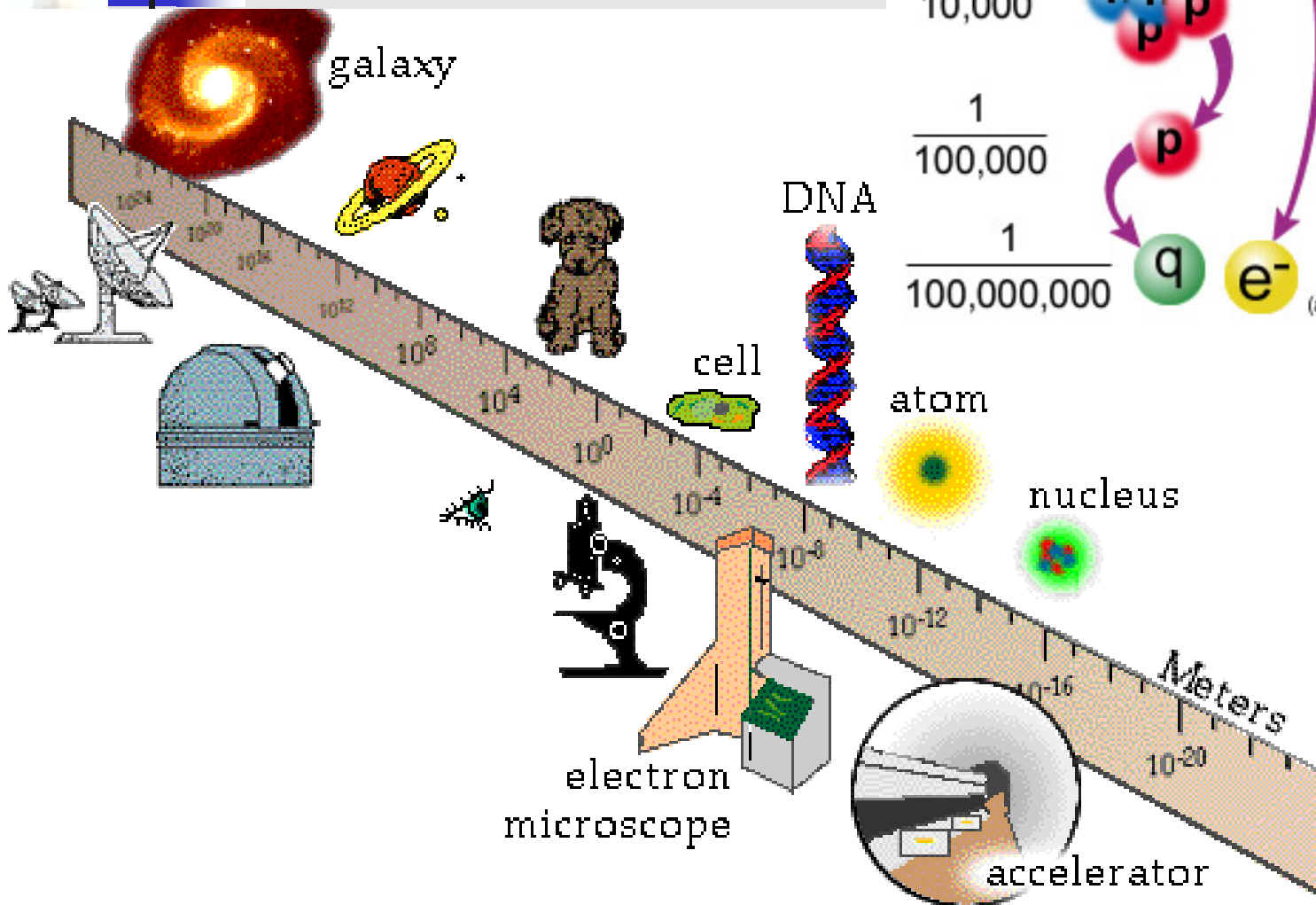
# *Extras from here on!*



*Gabriel Niculescu – HUGS 2016, JLab*



# A question of scale...





# *Another sense of scale...*



*escu – HUGS 2016, JLab*



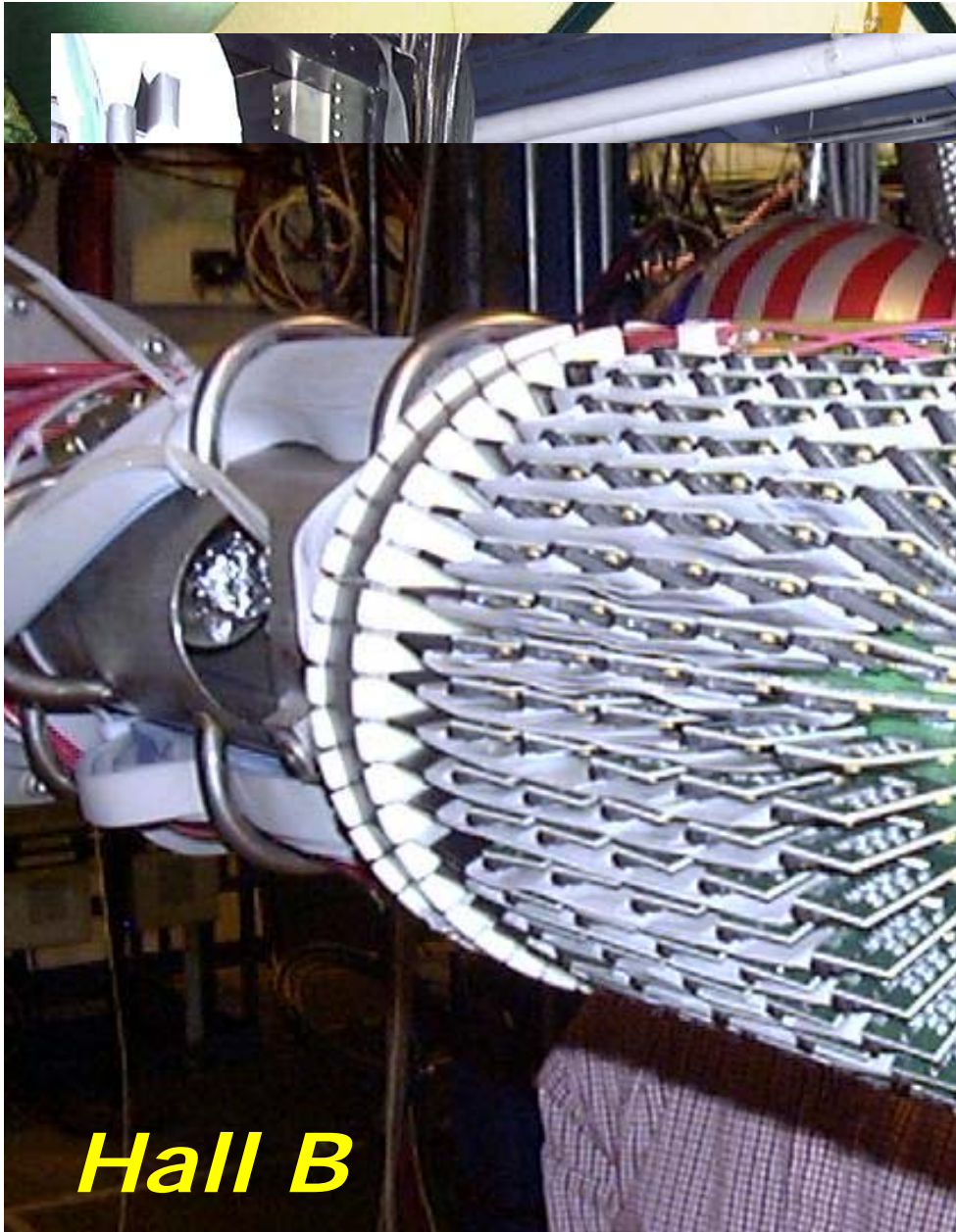


# *Another sense of scale...*



6/9/2016



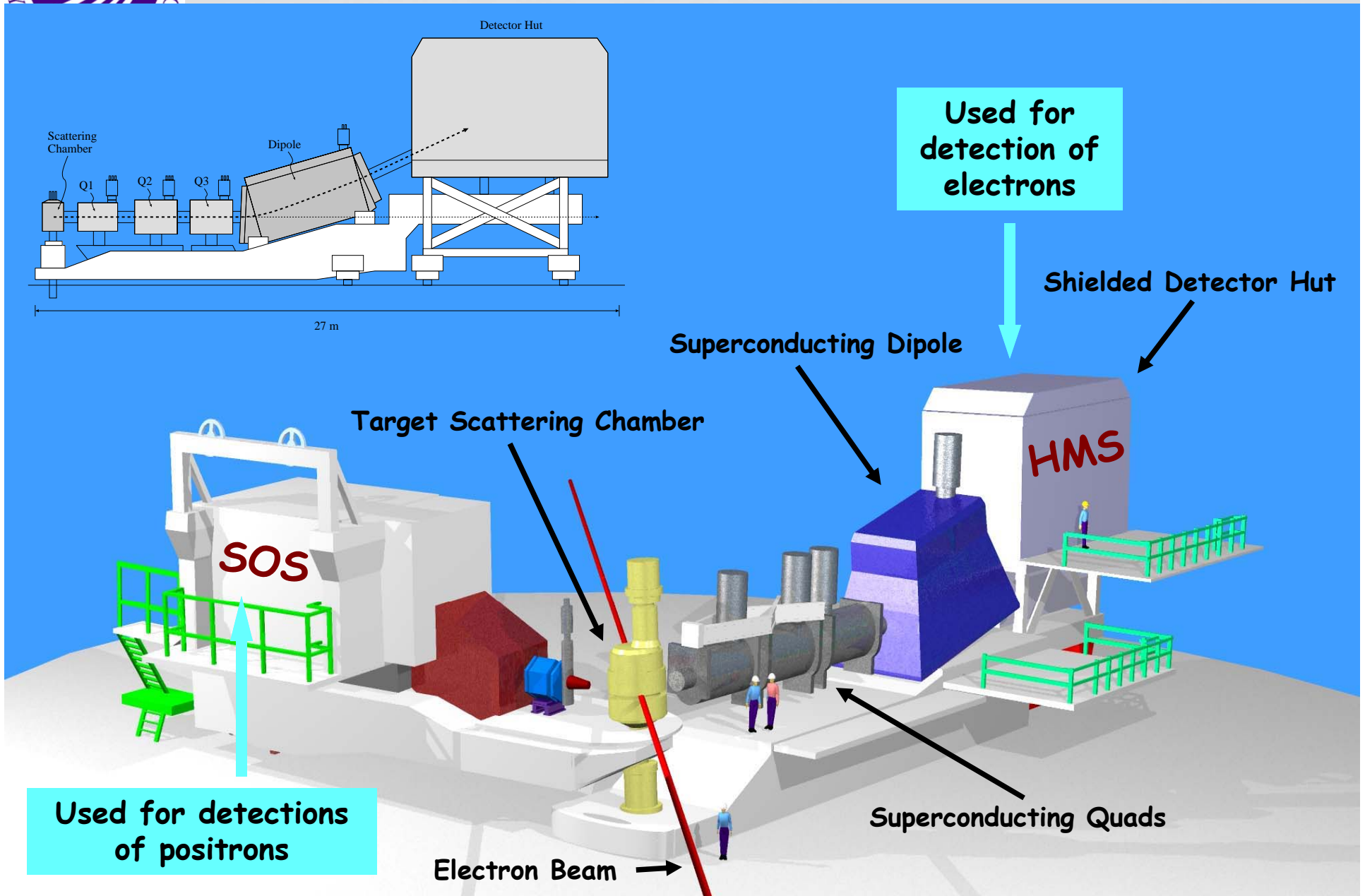


**Hall B**

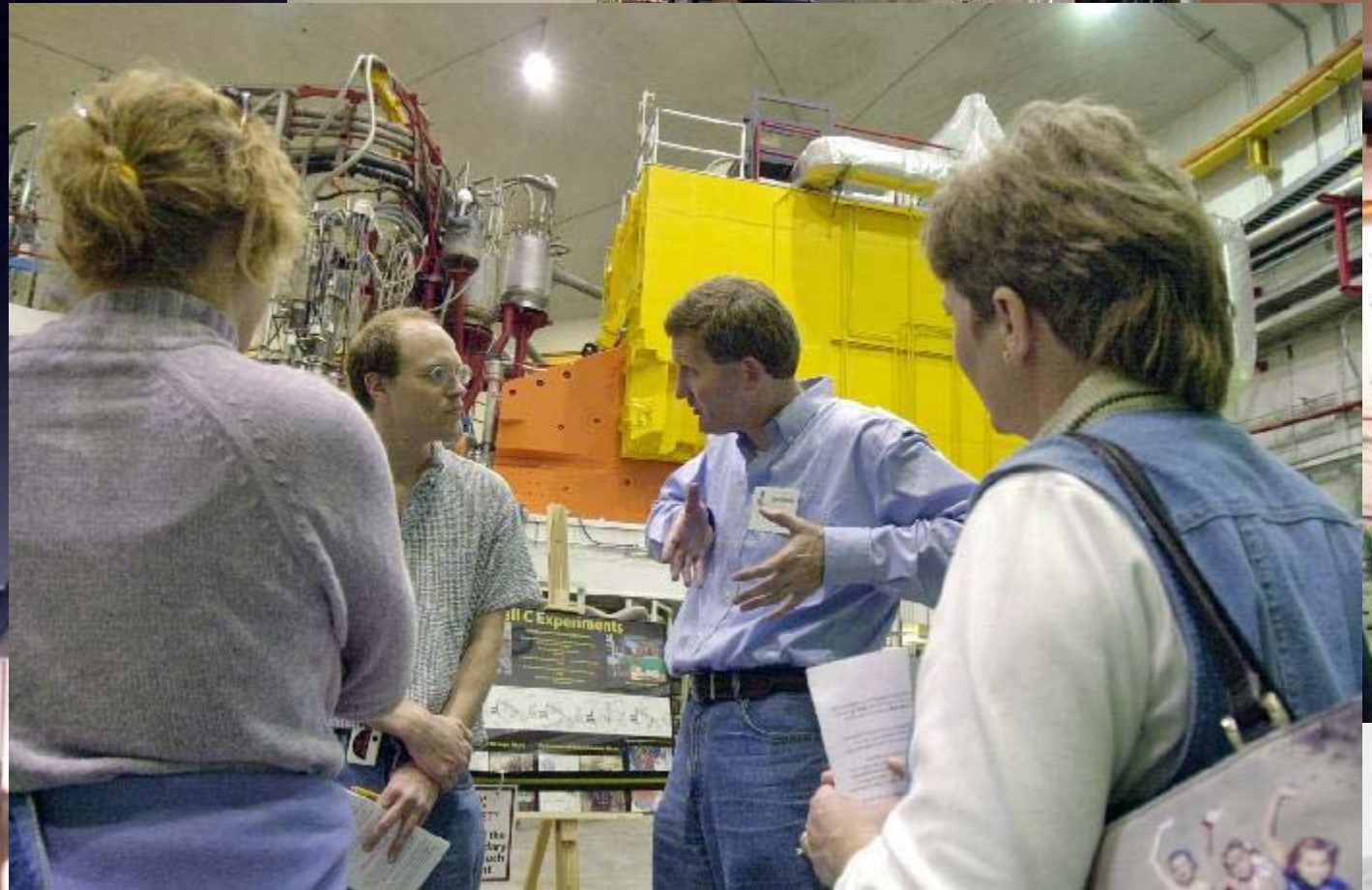


*Gabriel Niculescu – HU*





# Hall C

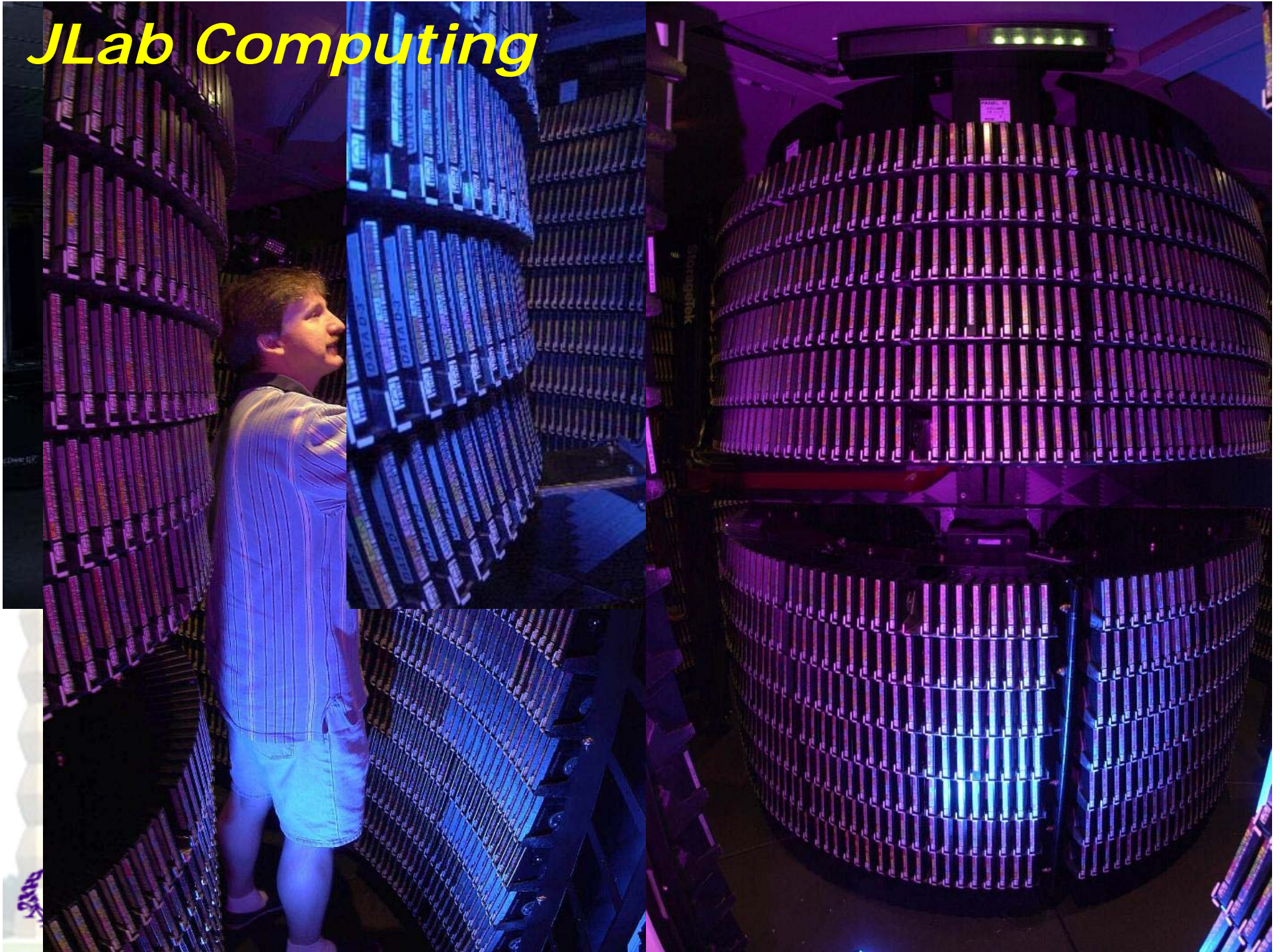








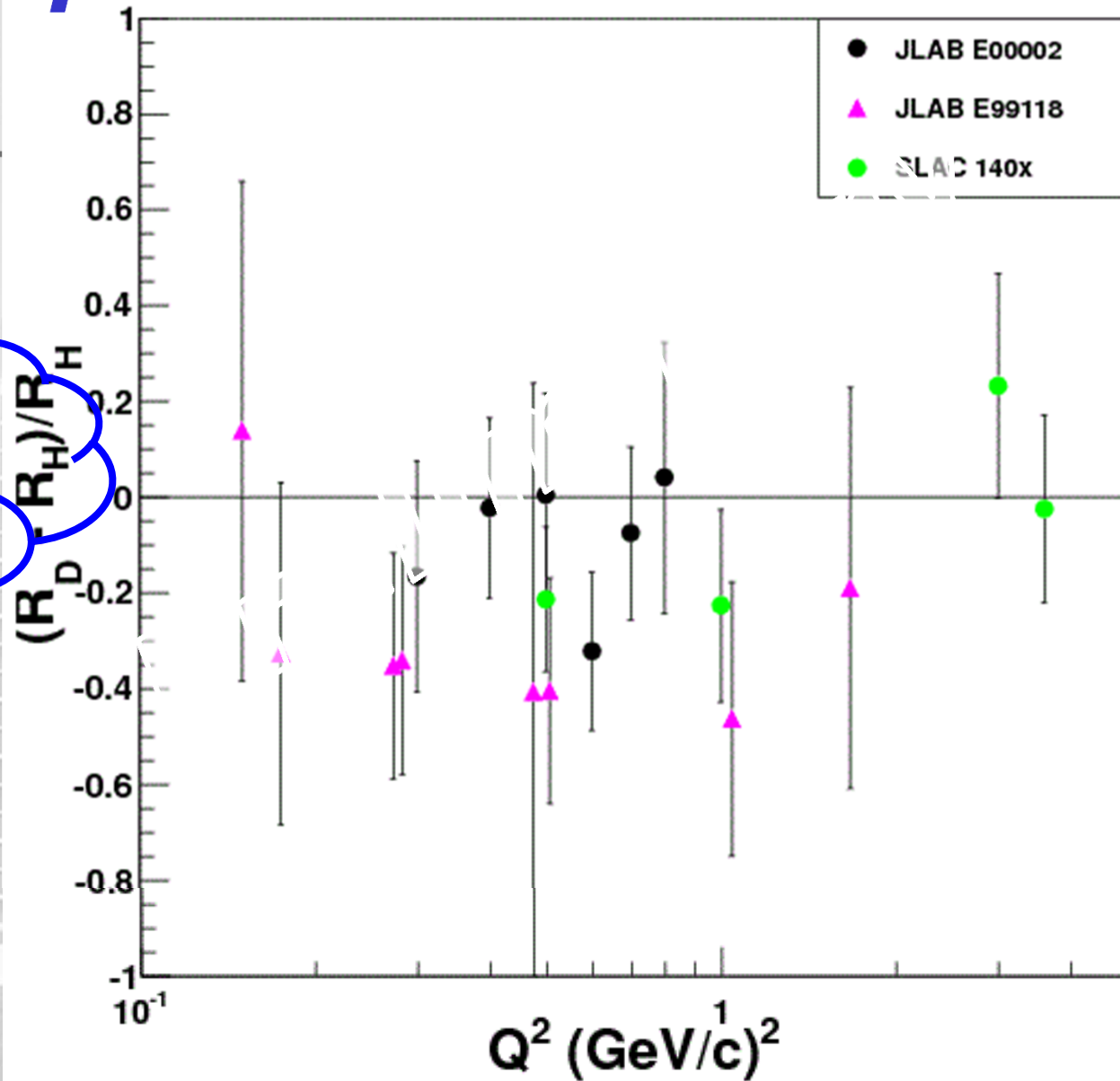
# JLab Computing





$$R = \frac{\sigma_L}{\sigma_T} = \frac{F_L}{2xF_1}$$

*Not very conclusive...  
Can one do better?*





*also part of the team...*







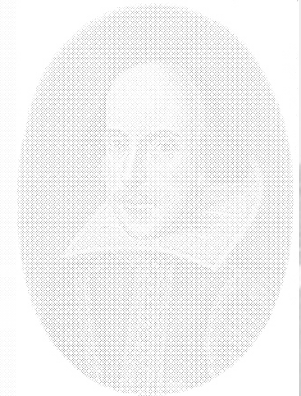


*"I was like a boy playing on the sea-shore, and diverting myself now and then finding a smoother pebble or a prettier shell than ordinary, whilst the great ocean of truth lay all undiscovered before me."*

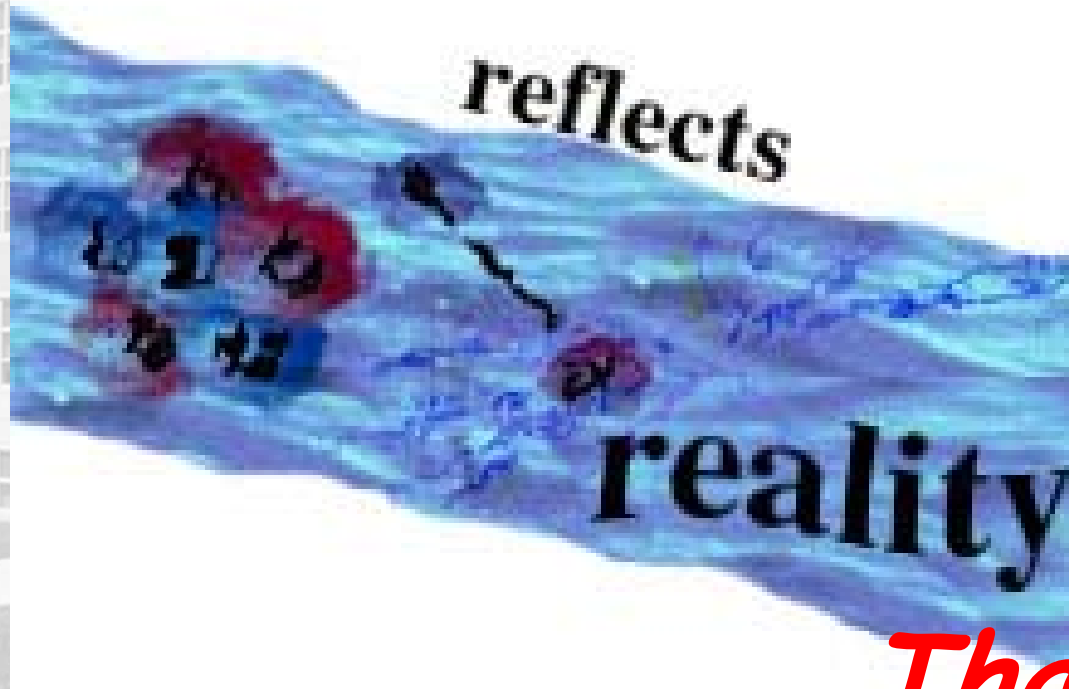
*Isaac Newton*



*A great while ago the world begun,  
With hey, ho, the wind and the rain,  
But that's all one, our play is done,  
And we'll strive to please you every day.*



*Feste's Song- TWELFTH NIGHT, W. Shakespeare*

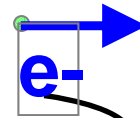


*Thank You!*

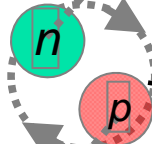


*What to  
What to*  
*They don't make  
Thinkers as they  
Used to...*

*...need a projectile*



*...and a target*



*...and...Eureka!*



*We've got it!!!*



*Gabrielle*

*, JLab*



Hamangia culture, about 5k years b4 Roc

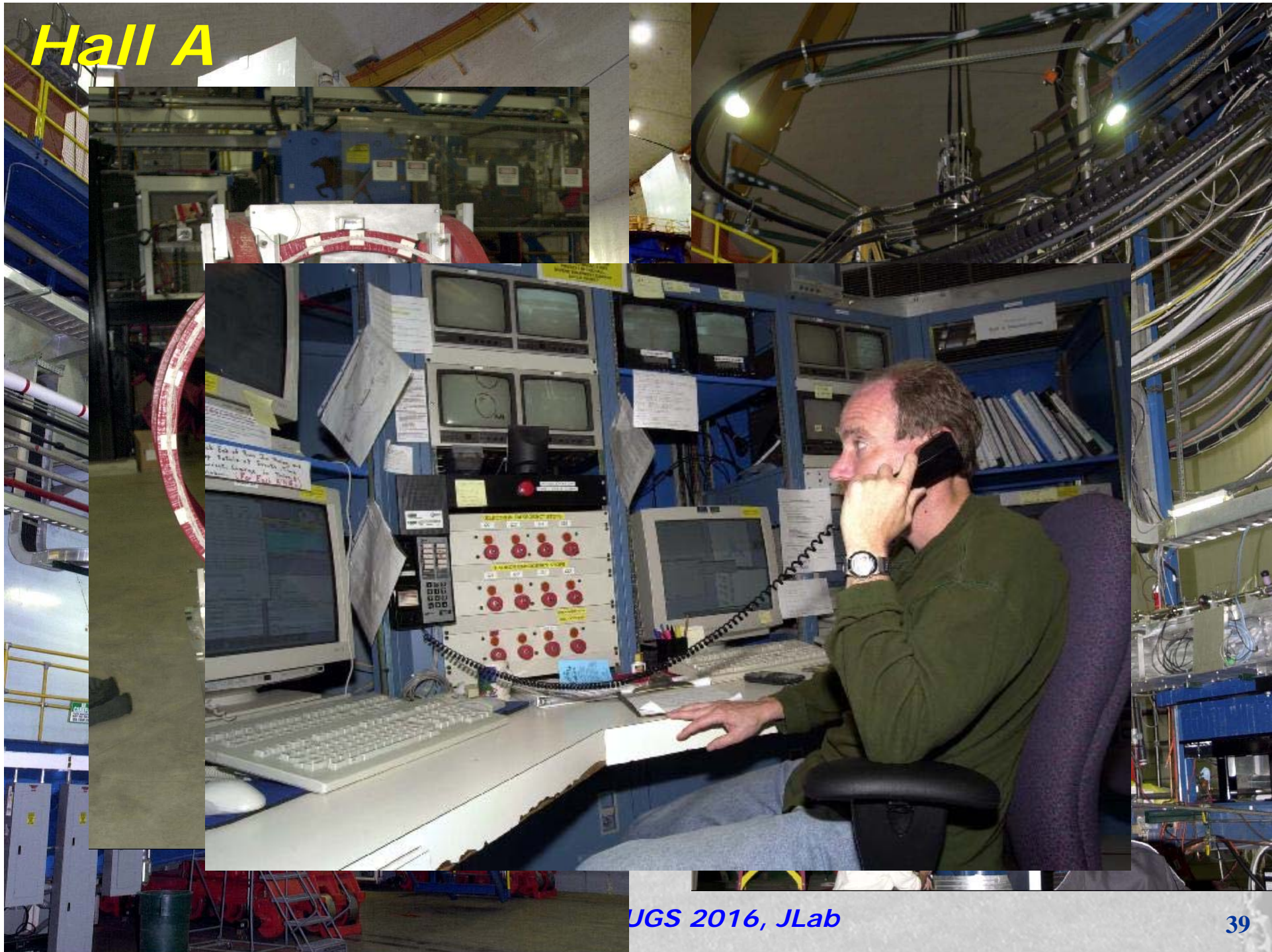


# What does this mean?





# Hall A





# The human factor...

```

int rabbitGraphs() {

    // Voltages to look at:

    char *fname="RabbitTest_08_17_06_HV_800_LED_08_onechannel.root";
    char *fname2="RabbitTest_08_17_06_HV_800_LED_08_onechannel.root";
    char *fname3="RabbitTest_08_17_06_HV_750_LED_08_onechannel.root";
    char *chan="1";
    int bns = 200;
    int xmax= 20000;
    int xmin= -100;
    char *txt = "";
    int c = 1;

    //First Graph
    TFile *f = new TFile(fname);
    TText *t1 = new TText(6550,4000,fname);

    //Display canvas according to golden ratio
    TCanvas *c1 = new TCanvas("c1","RABBIT",900,556);
    TH1F *h10 = new TH1F("h10",fname,bns,xmin,xmax);
    h10->SetLineColor(2);
    c1->Clear();

    ntped->Draw("ped>>h10",chan);
    h10->SetFillColor(3);
    h10->Draw();

    //Second Graph
    TH1F *h11 = new TH1F("h11",fname2,bns,xmin,xmax);
    TFile *f = new TFile(fname2);
    ntped->Draw("ped>>h11","chan==1","same");

    //Third Graph
    TFile *f = new TFile(fname3);
    ntped->Draw("ped>>h11","chan==1","same");

    return 1;
}

```



# The human factor...

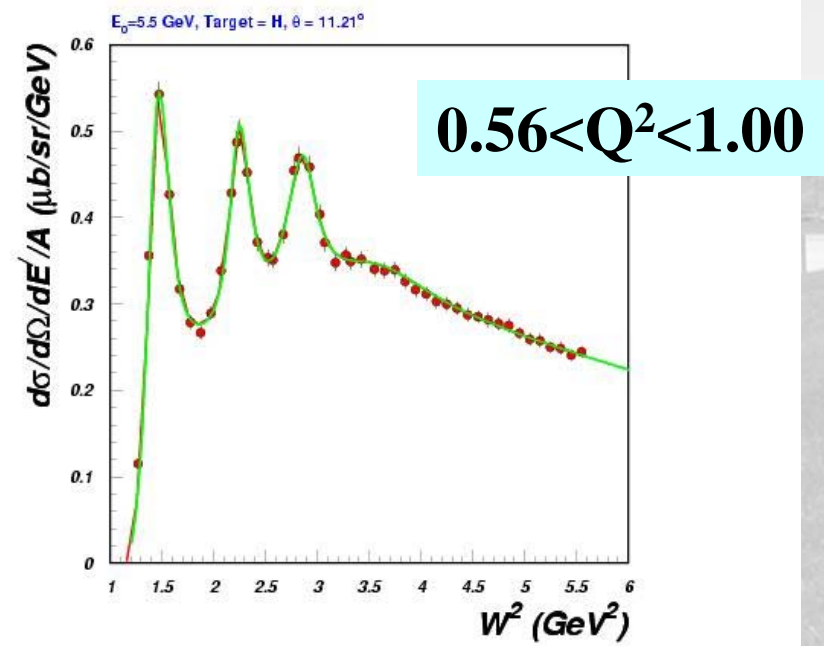
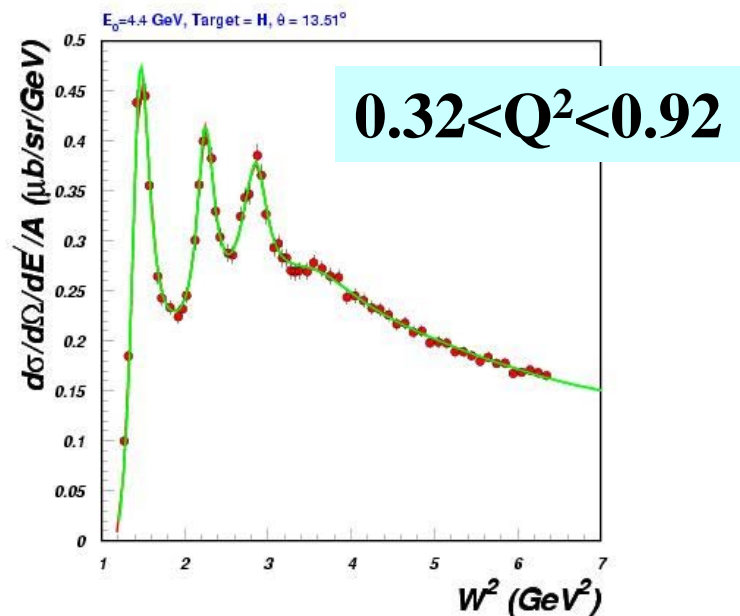
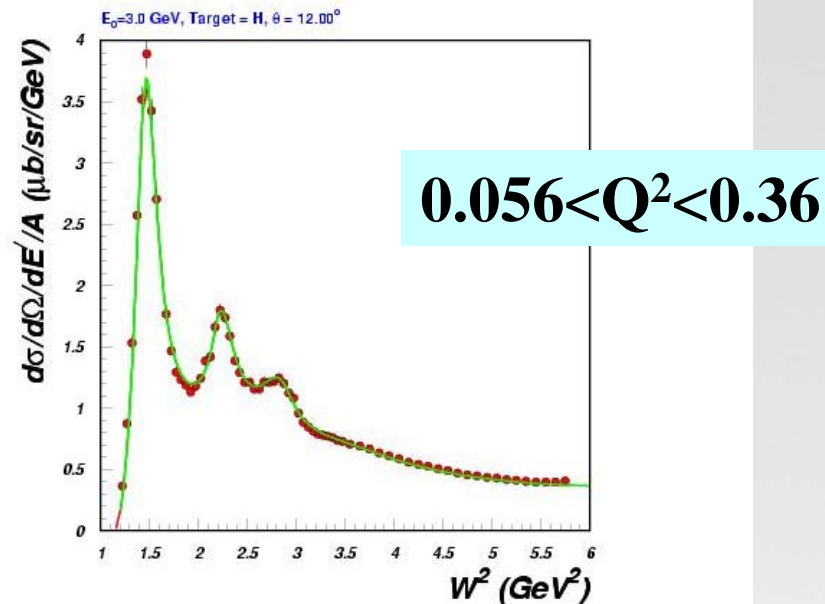
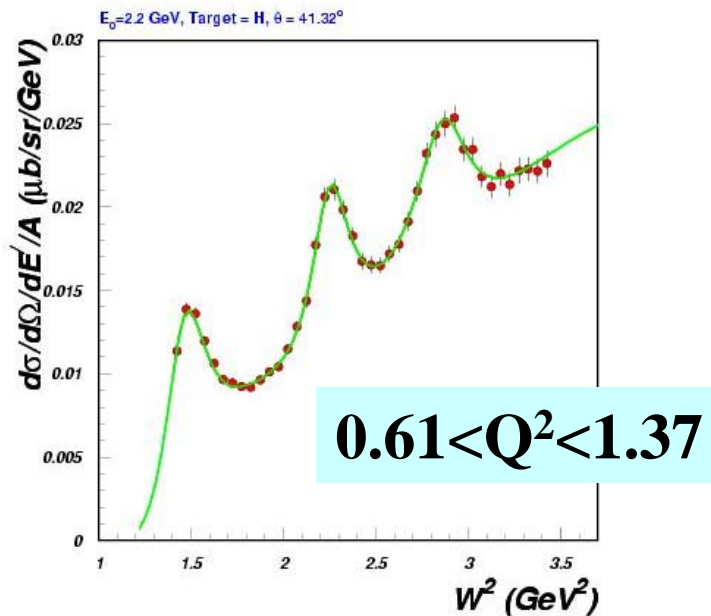




# *The human factor...*







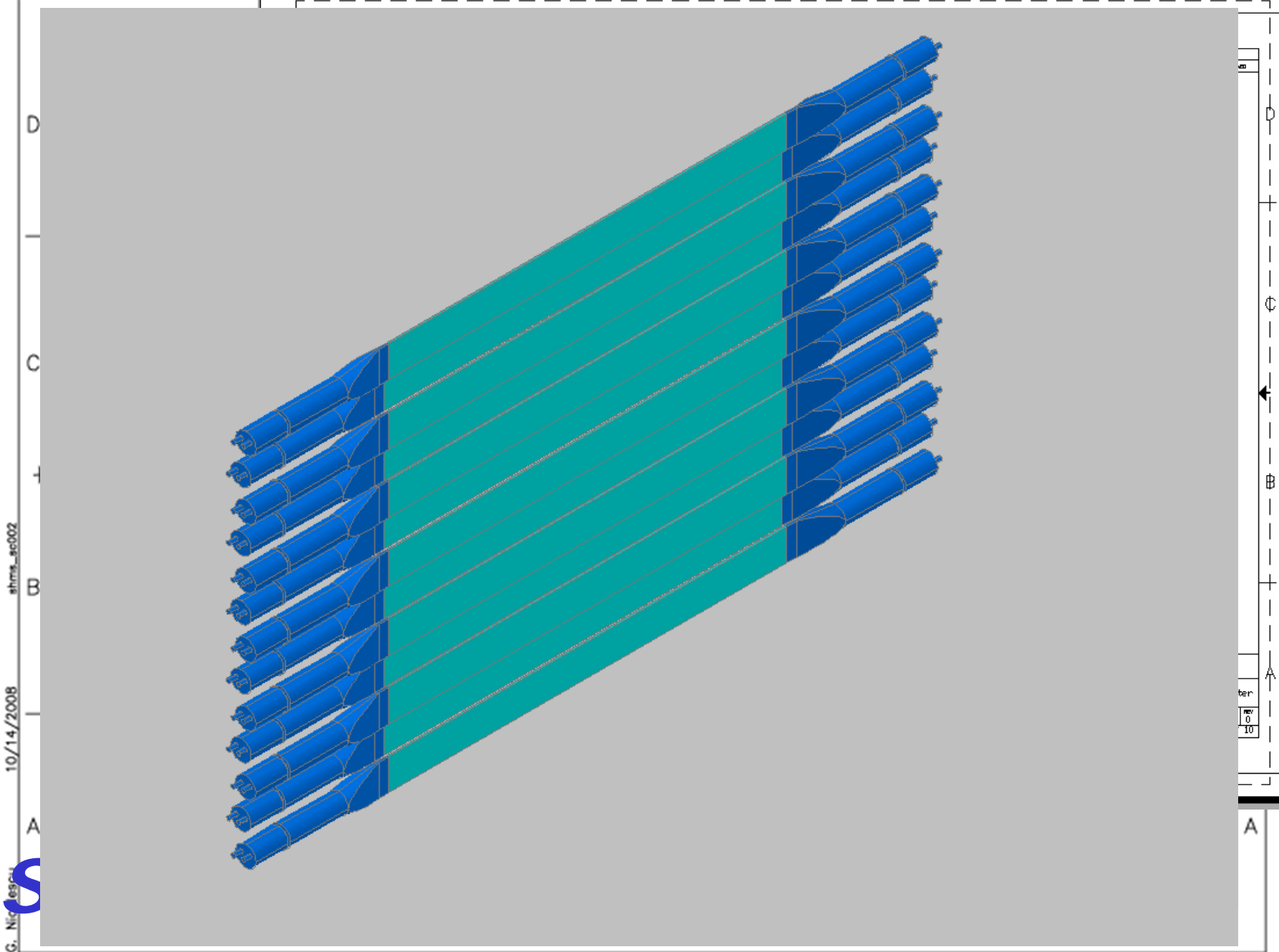


PHYSICS  
JAMES  
DISON



UNIVERSITY.



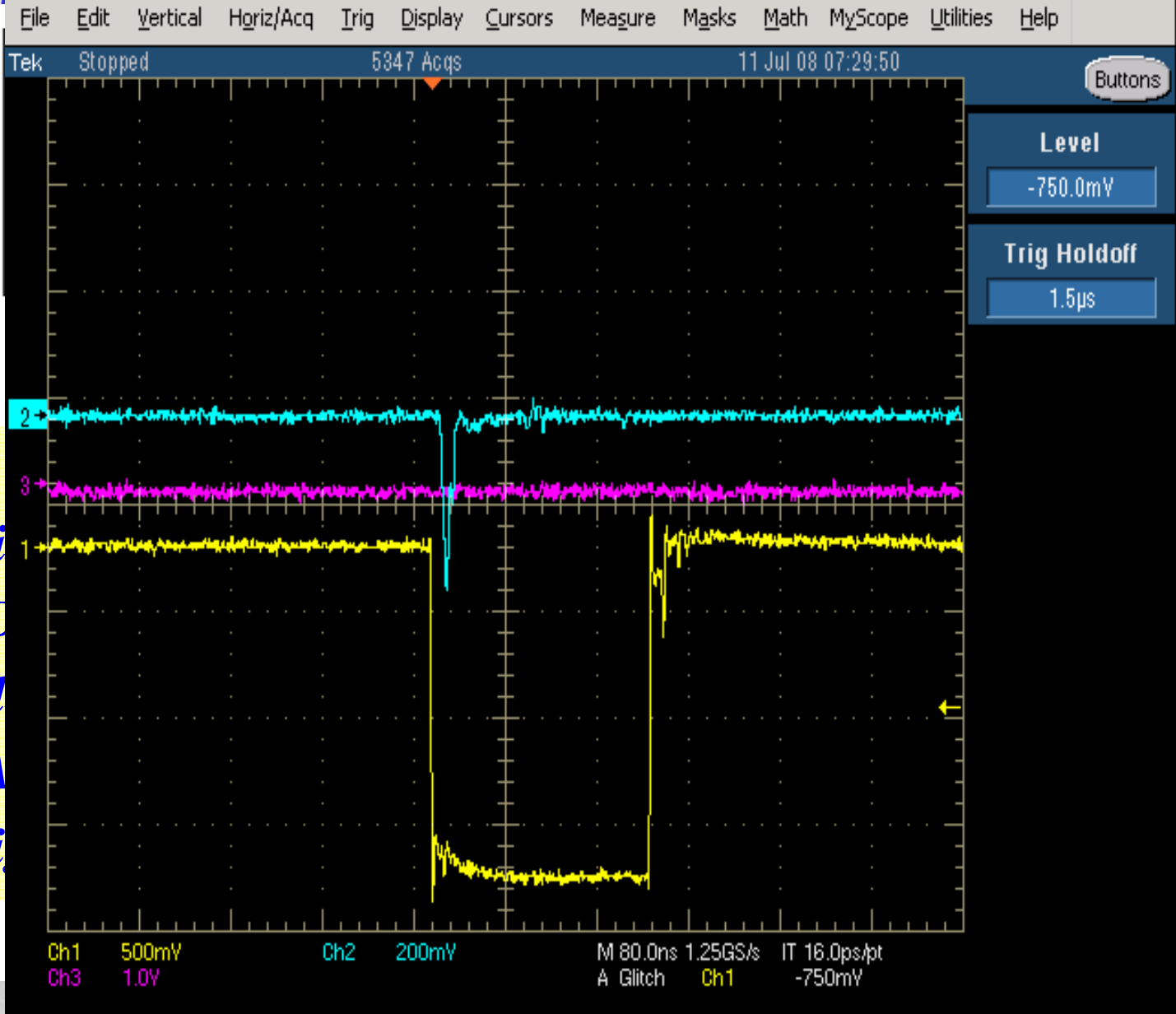


G. Nic...



# JMU Test Stand

Work by Dillon



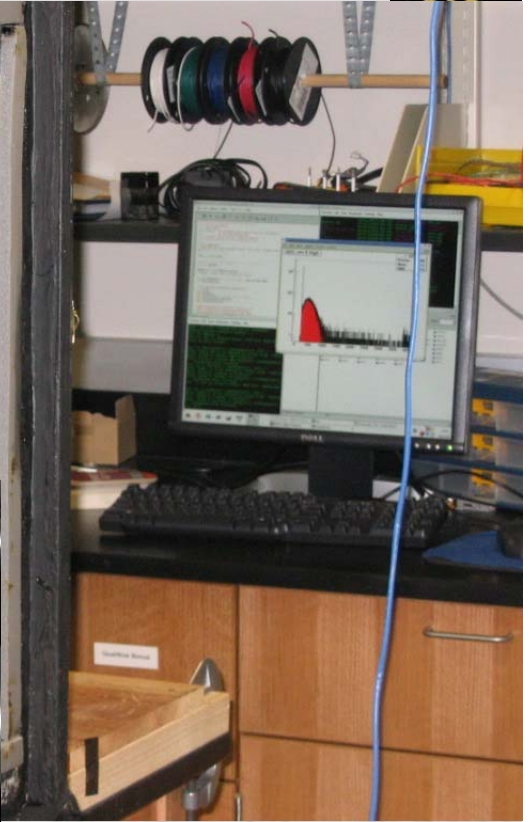
- + Dark box ("si
- + VME-based D
- + Running Cod
- + ROOT/C++ A
- + It all works ri



Gabriel Niculescu – HUGS 2016, JLab



# JMU Test Stand pictorial



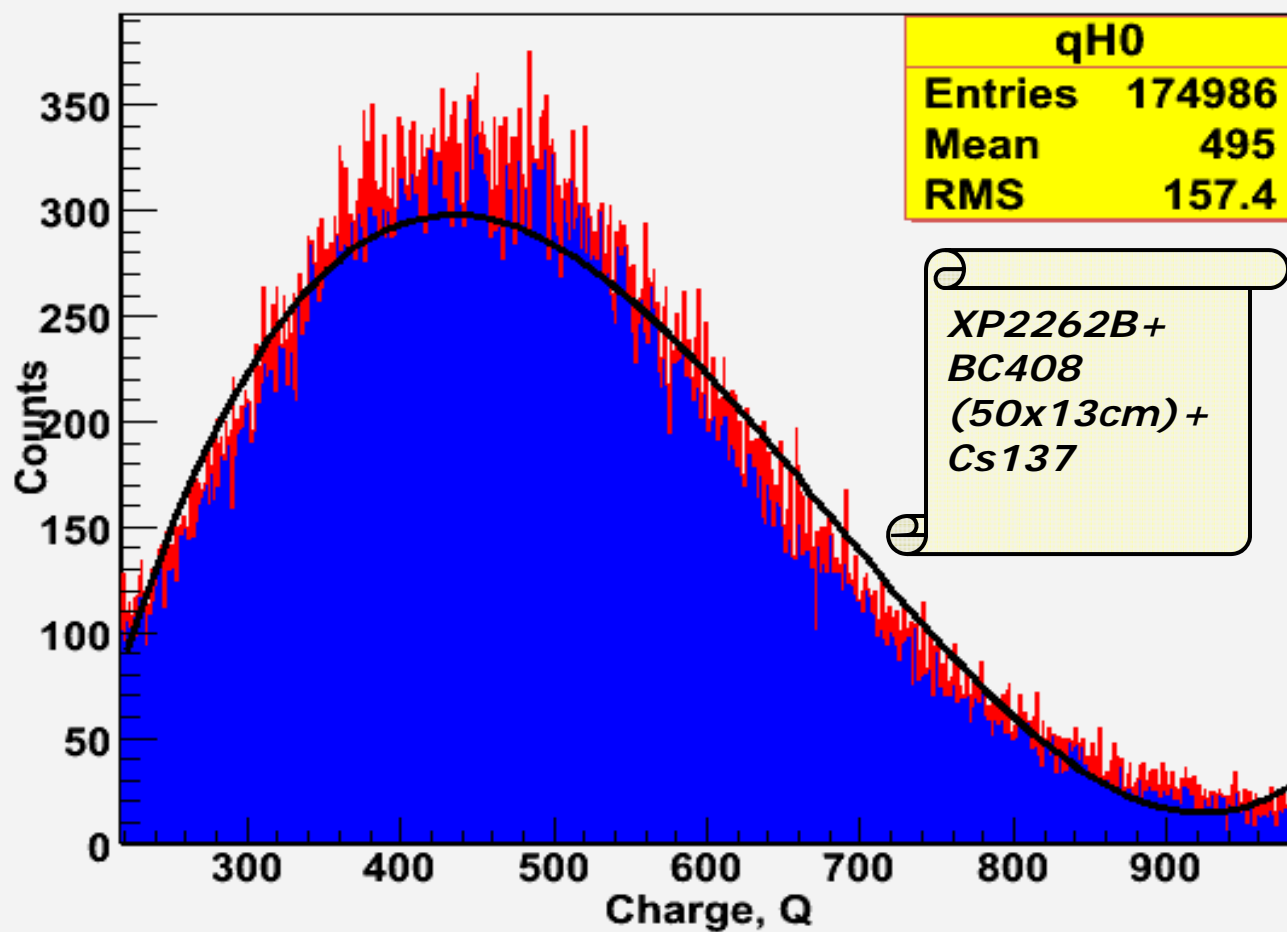
## Histogram of PMT Test #11

More JMU SHMS hodoscope HODO- Testing



## Pedestal of PMT Test #11

## Signal of PMT Test #11





# $F_2^n / F_2^p$ (d/u) Ratio at Large x

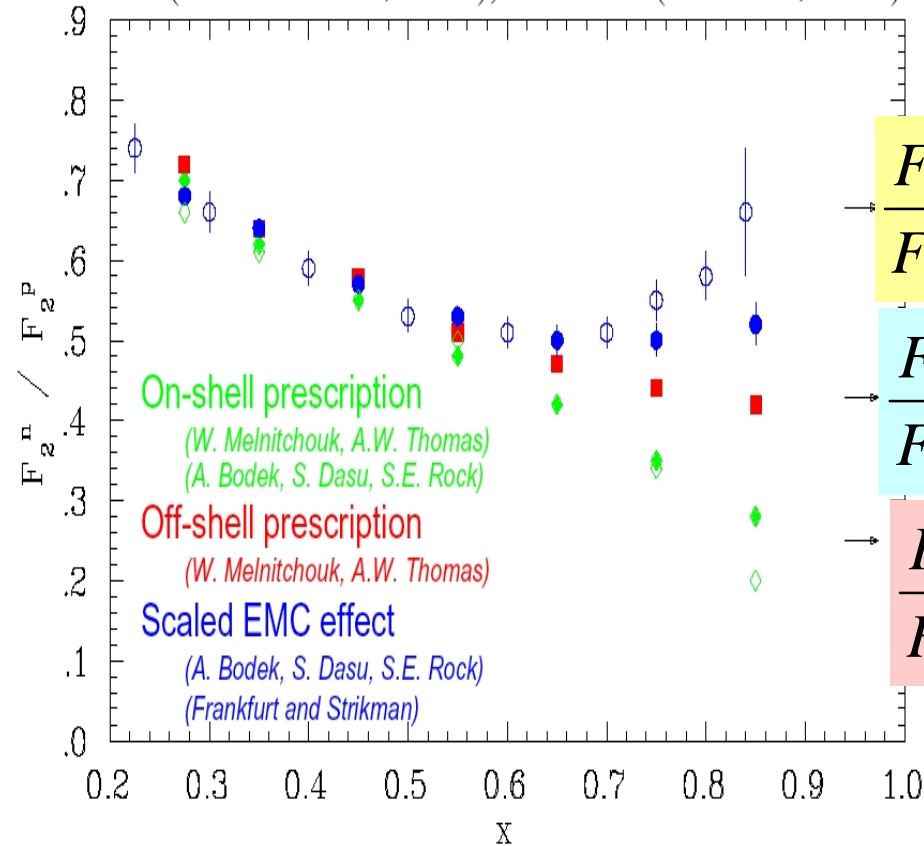
$$\frac{F_{2n}}{F_{2p}} \approx \frac{1+4d/u}{4+d/u} \Rightarrow$$

$$\frac{d}{u} \approx \frac{4 F_{2n}/F_{2p} - 1}{4 - F_{2n}/F_{2p}}$$

$$F_{2n}/F_{2p} = F_{2d}/F_{2p} - 1$$

???

Proton and deuterium data from SLAC E139  
(L. W. Whitlow, et al.), and E140 (J. Gomez, et al.)

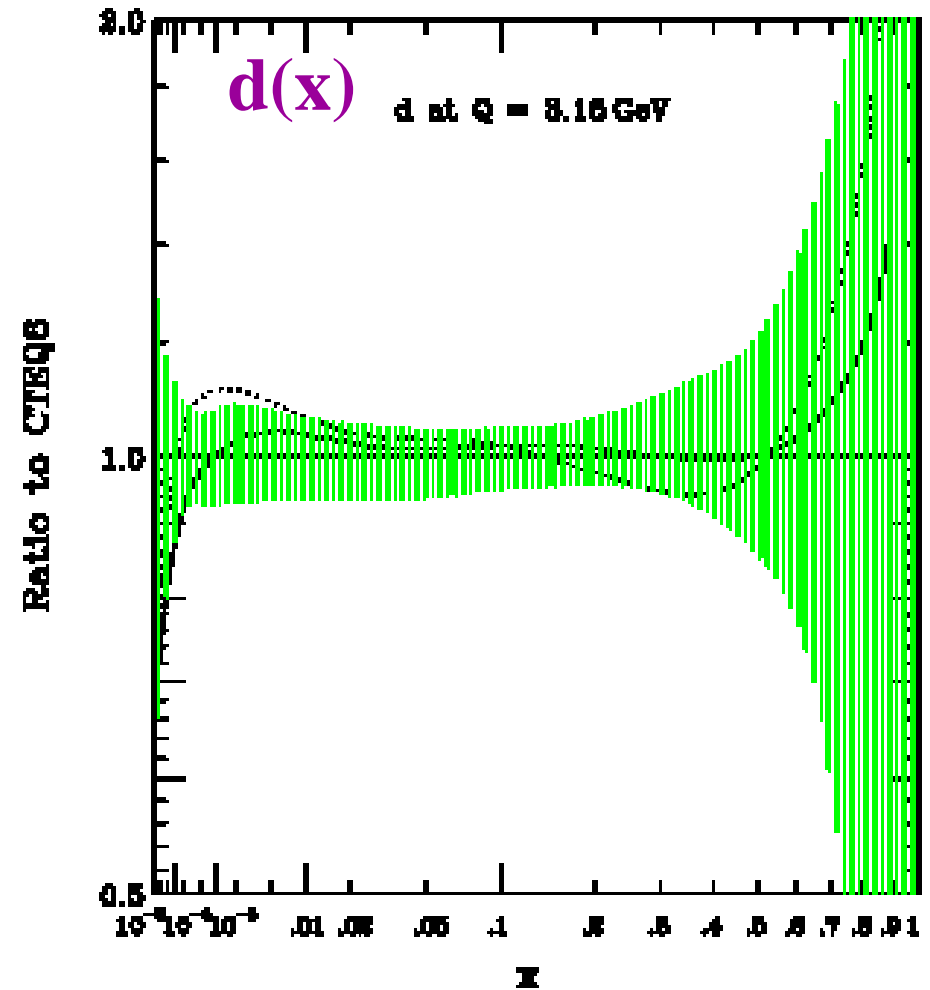
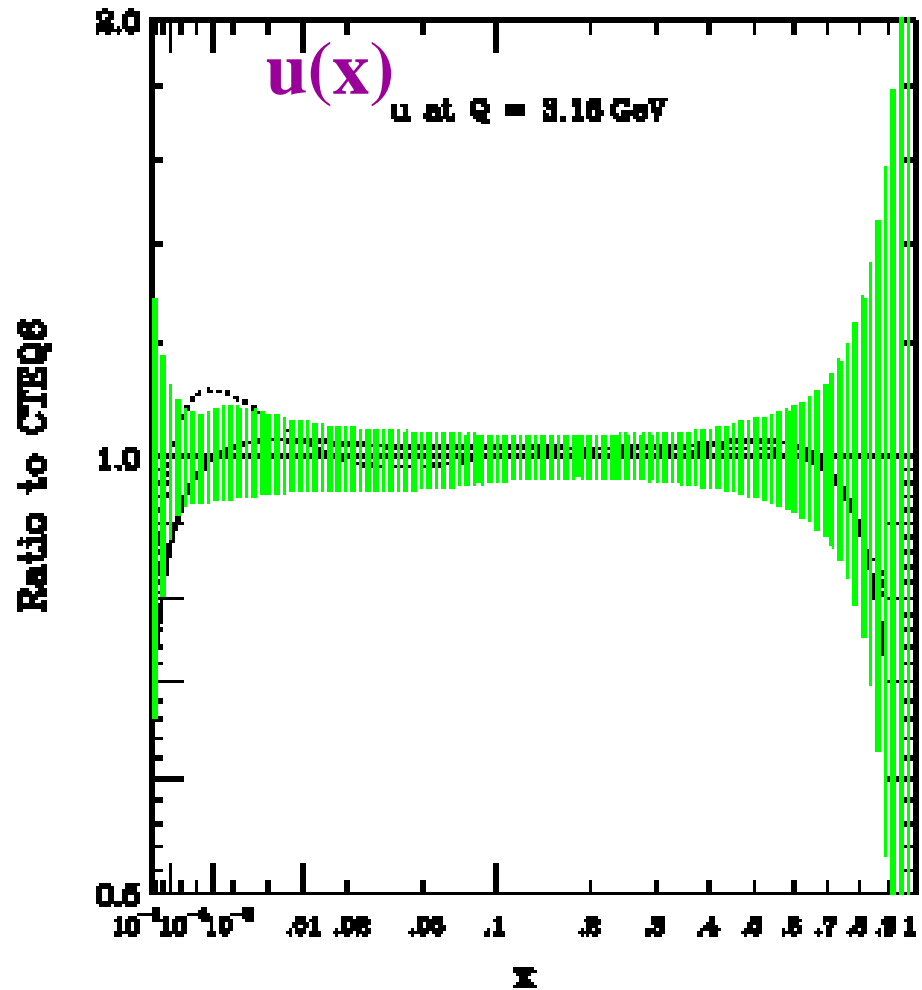


$$\frac{F_2^n}{F_2^p} = \frac{2}{3} \Rightarrow \frac{d}{u} = \frac{1}{2}$$

$$\frac{F_2^n}{F_2^p} = \frac{3}{7} \Rightarrow \frac{d}{u} \rightarrow \frac{1}{5}$$

$$\frac{F_2^n}{F_2^p} = \frac{1}{4} \Rightarrow \frac{d}{u} \rightarrow 0$$

# Parton Distribution Functions



PDF's by far least well known at large x!!





# *Problem Solution Working Improving*

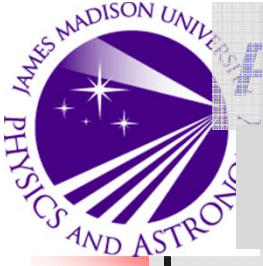


## *Service*



- ⊕ *Both R1s and PUIs want faculty 2d "service"*
- ⊕ *Outreach (community, prospective students\*)*
- ⊕ *Recruiting*
- ⊕ *Seminar*
- ⊕ *...*
- ⊕ *Serving in committees, commissions, panels*





## *So what can a person do?*

- ⊕ *Educate yourself about current trends in teaching (techniques, hardware, lingo)*
- ⊕ *Know what clickers are, what is “active learning”, FCI, “flipped classroom”, “think-pair-share”...*
- ⊕ *... or whatever is “trendy” in physics education when you apply*
- ⊕ *don’t “talk down” any of them\**
- ⊕ *Try (really hard) to take a liking to one or two of these...*

