How to give a good talk

Mark Messier
Indiana University
Fermilab Users' Meeting
June 13, 2019

These are some personal tips that I try to follow to prepare for my own high-profile talks. For me the key is to first think about who my audience will be and tailor the content and format of the talk for them. When constructing the talk I try to focus on my story first, and then the visuals.

Audience

Content

Format

Language

https://www.nytimes.com/2012/07/05/science/cern-physicists-may-have-discovered-higgs-boson-particle.html

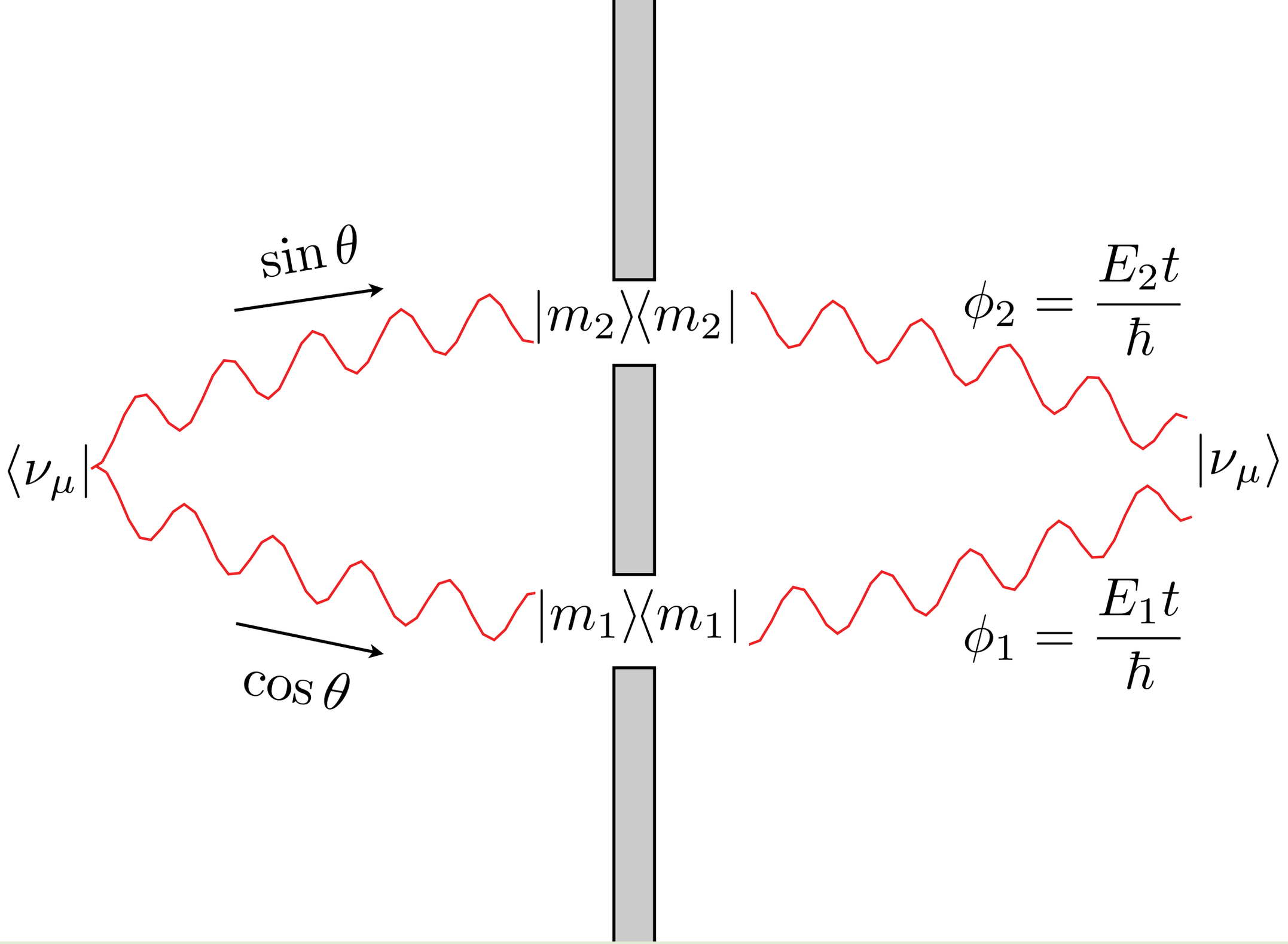
Colloquium Seminar Research plan

Colloquium Seminar Research plan

Audience: An entire department

Content: Place your work in the context of physics as a whole

Language: Use language shared by all physicists that undergraduates can understand



$$P(\nu_\mu \to \nu_\mu) = 1 - \sin^2 2\theta \sin^2\left(1.27\Delta m^2[\mathrm{eV}^2]\frac{L[\mathrm{km}]}{E[\mathrm{GeV}]}\right)$$

Courtesy of CERN

SPECIAL REPORT **THE SCIENCE OF INEQUALITY** WHY THE GROWING GAP BETWEEN RICH AND POOR IS A PROBLEM FOR EVERYONE

SCIENTIFIC AMERICAN

SLEEP LEARNING

How to improve memories during slumber

PLUS

CAN GEOMETRY SAVE DEMOCRACY?
Mathematicians fight against gerrymandering

TEAM PLAYERS
Microbial partnerships that rule the planet

BACK IN TIME
Searching for the most distant galaxies in the universe

NOVEMBER 2018
ScientificAmerican.com

WIN $2,500 IN OUR COMET PHOTO CONTEST! DETAILS p.7

Discover

SCIENCE FOR THE CURIOUS

November 2013

COMET WATCH

All eyes are on ISON for a show 4 billion years in the making p.32

OCD VS. FREE WILL
Changing the way we think (literally!) about obsessive behavior p.52

ROBOTS INVADE THE CLASSROOM p.66

ELEPHANTS IN THE CROSSFIRE
Civil war and slaughter turned this researcher into an activist p.38

ENDER'S GAME
Filming the unfilmable p.68

Colloquium Seminar Research plan

Audience: An entire department

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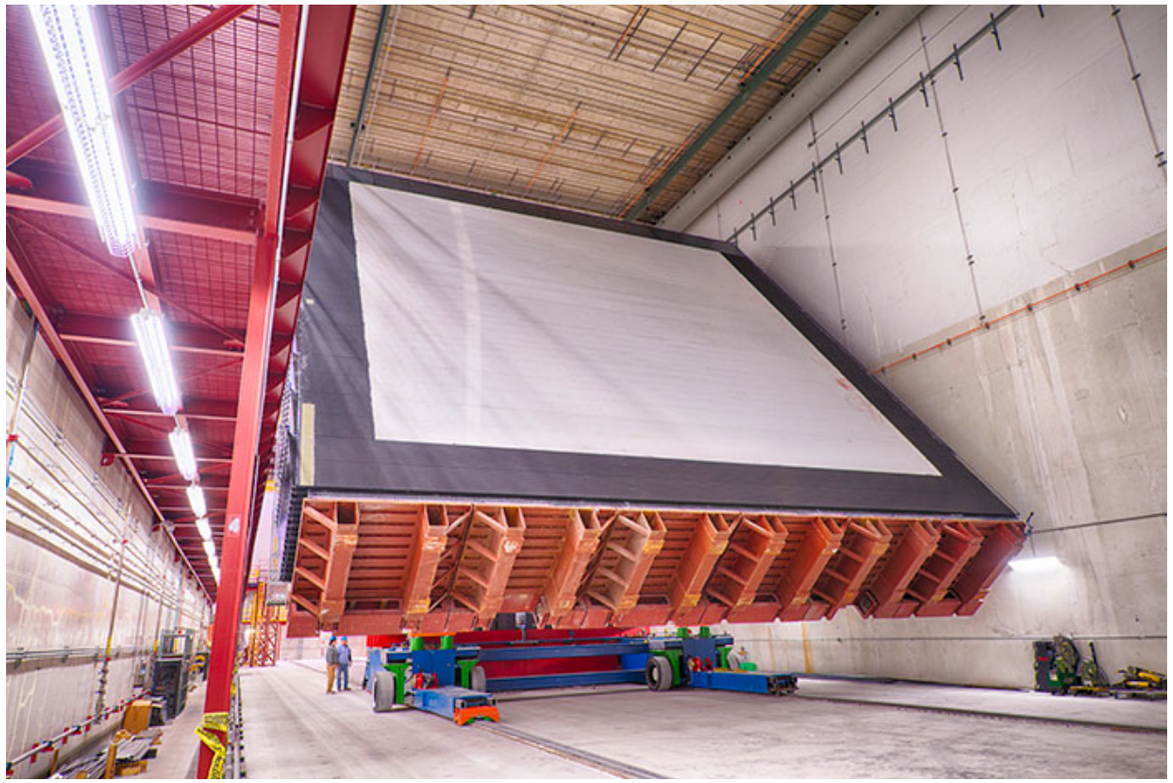
Language: Use language shared by all physicists that undergraduates can understand

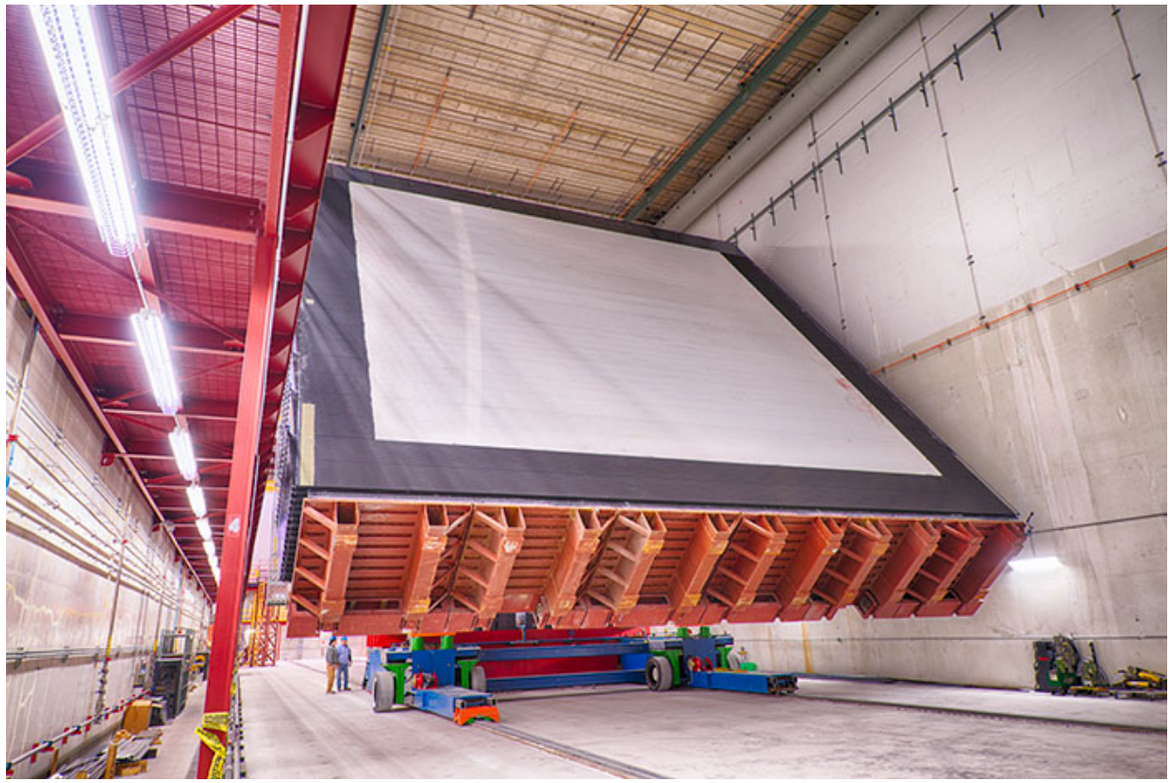
Format: Your only audience is in the room. Talk to them!

The NOvA Experiment

- Total mass is 14 kilotons, 9 kilotons of scintillator contained in a 5 kiloton PVC structure
- The structure in 15 m x 15 m x 60 m long segmented into 4 cm x 6 cm cells
- Cells are filled with liquid scintillator
- Wave length shifting fibers capture light and bring it to the face of avalanche photodiodes
- The cells are 15 m long and alternate in vertical and horizontal orientations



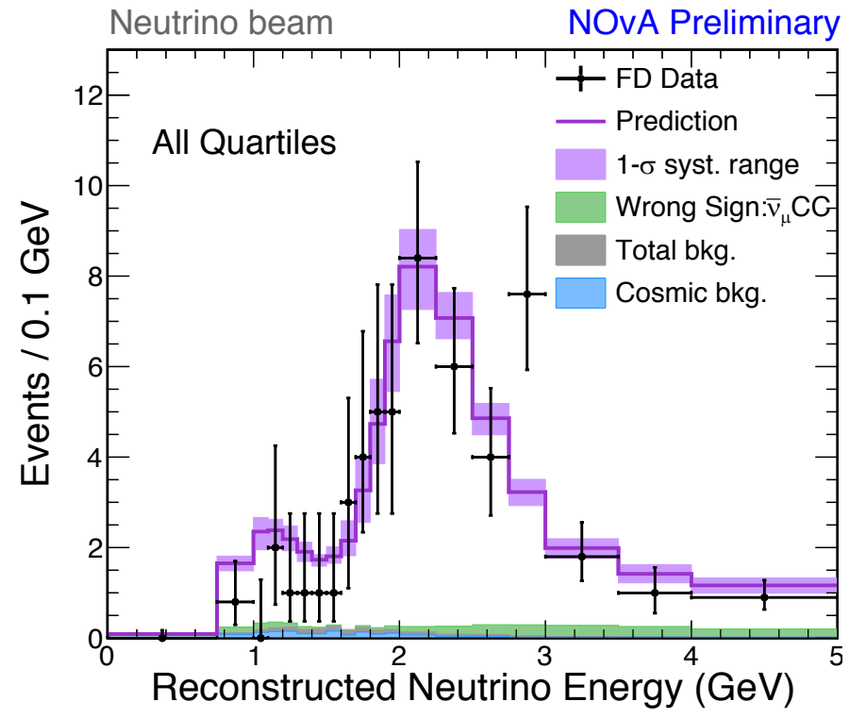
The NOvA Experiment

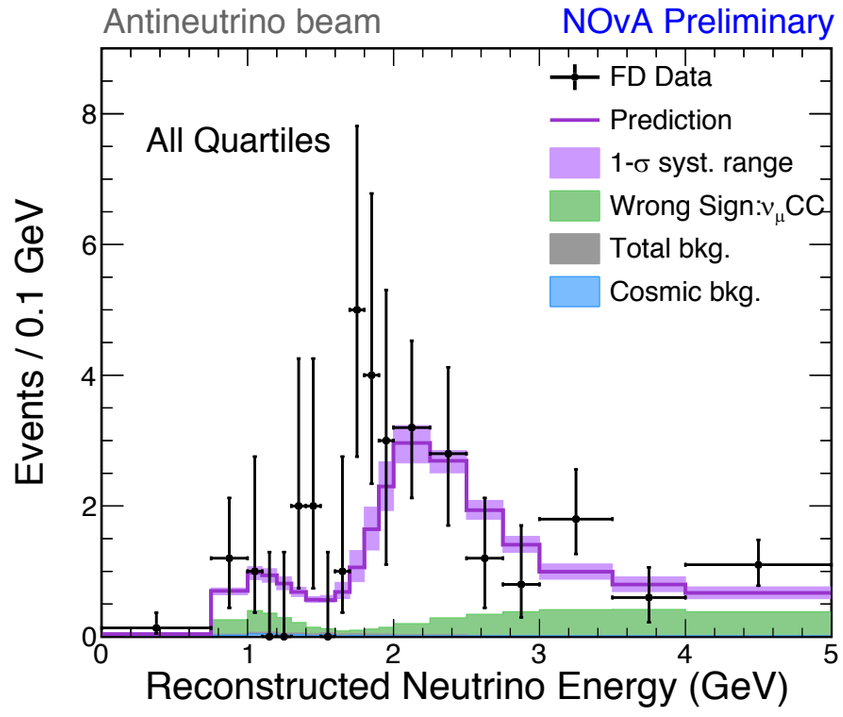


Muon neutrino results

Measured 113 muon neutrino events at the far detector; 65 antineutrino events.

Expected 730 and 266 before oscillations





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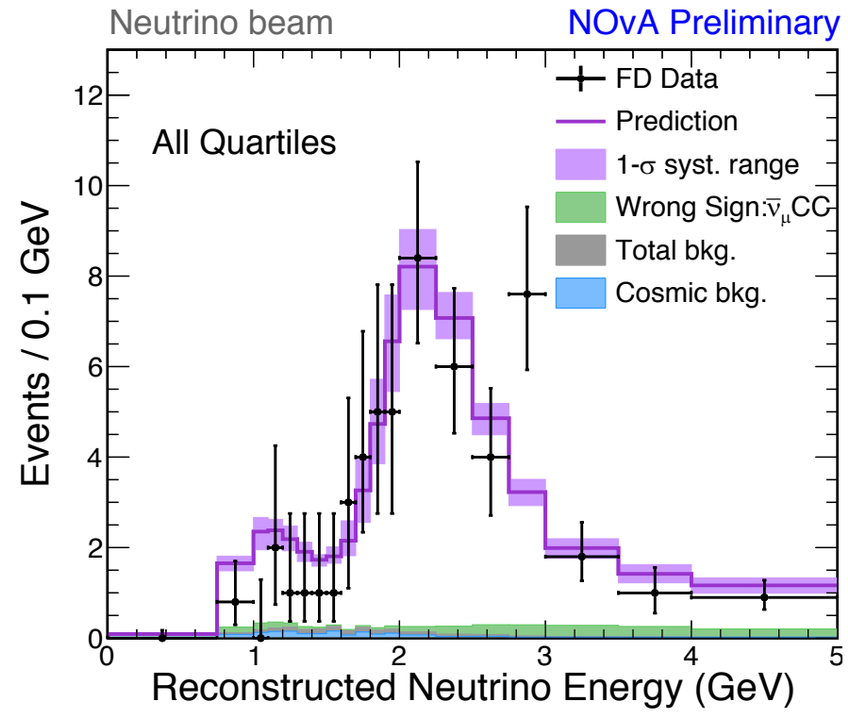
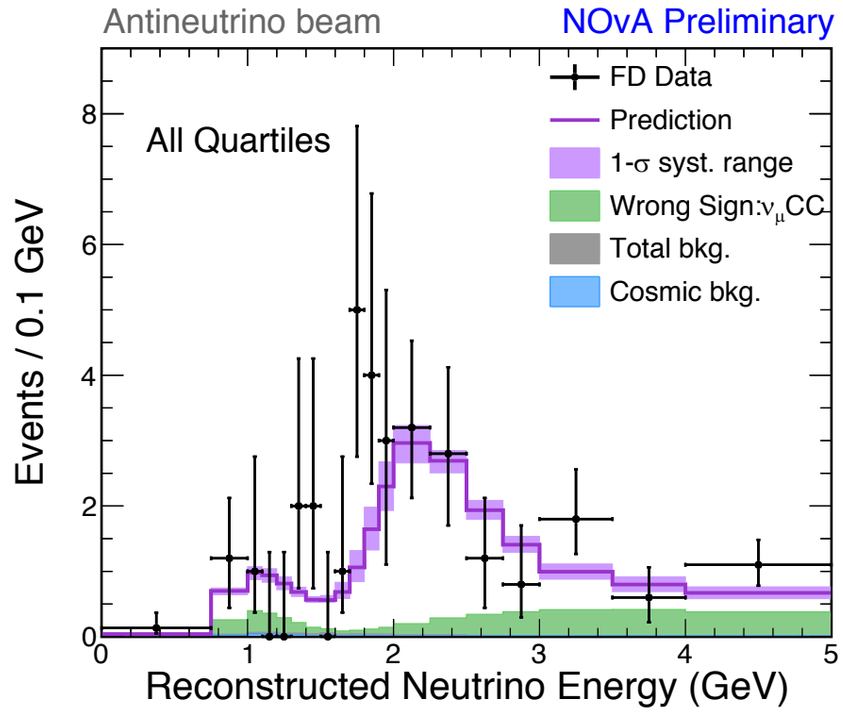
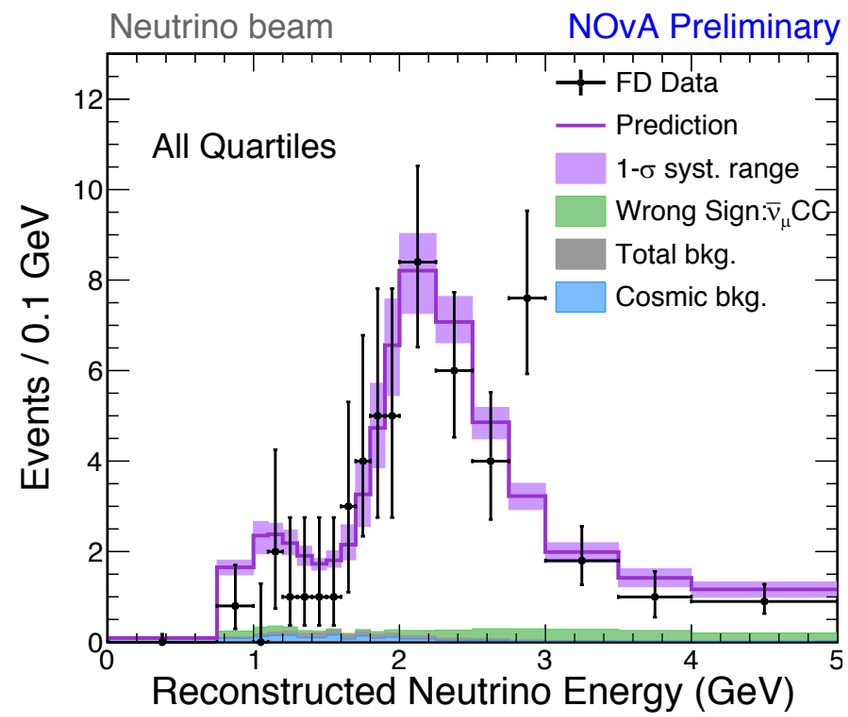
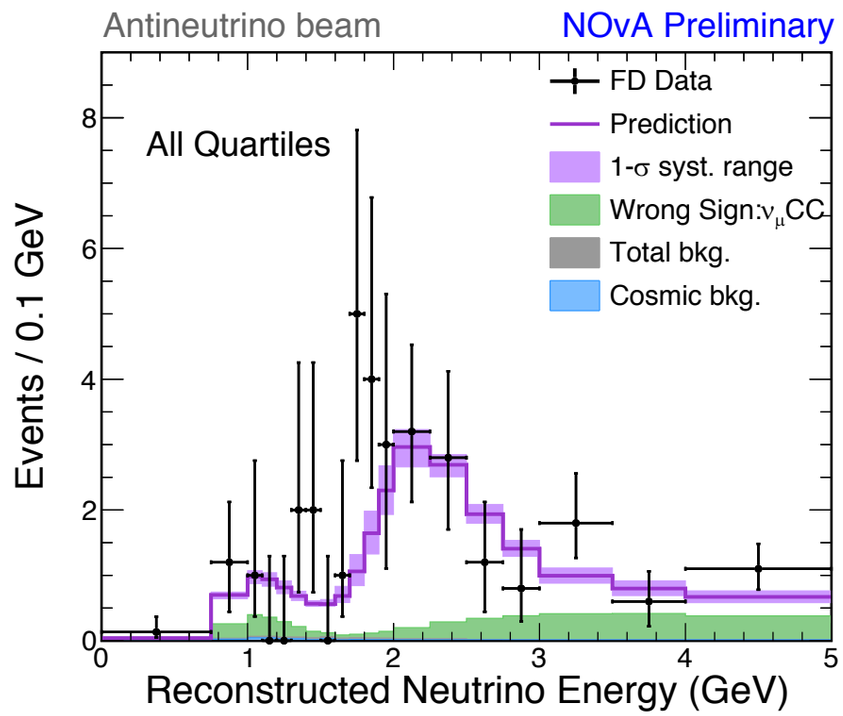
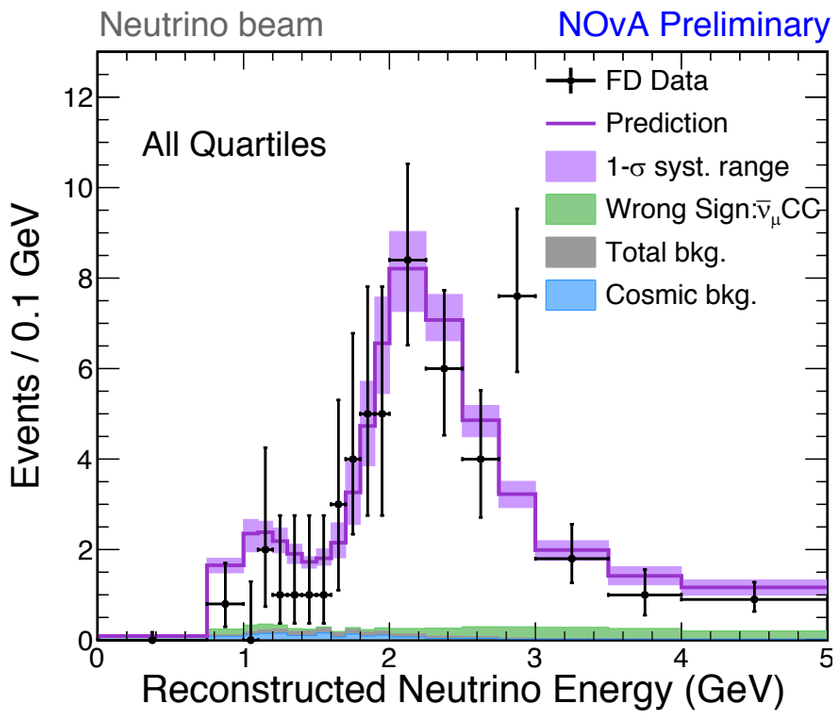





Neutrino beam
NOvA Preliminary
All Quartiles
FD Data
Prediction
1-σ syst. range
Wrong Sign:$\bar{\nu}_\mu$CC
Total bkg.
Cosmic bkg.
Events / 0.1 GeV
Reconstructed Neutrino Energy (GeV)


Antineutrino beam
NOvA Preliminary
All Quartiles
FD Data
Prediction
1-σ syst. range
Wrong Sign:ν_μCC
Total bkg.
Cosmic bkg.
Events / 0.1 GeV
Reconstructed Neutrino Energy (GeV)


Neutrino beam
NOvA Preliminary
All Quartiles
FD Data
Prediction
1-σ syst. range
Wrong Sign: $\bar{\nu}_\mu$CC
Total bkg.
Cosmic bkg.
Events / 0.1 GeV
Reconstructed Neutrino Energy (GeV)
0
2
4
6
8
10
12
0
1
2
3
4
5

Antineutrino beam

NOvA Preliminary

All Quartiles

FD Data

Prediction

1-σ syst. range

Wrong Sign:ν_μCC

Total bkg.

Cosmic bkg.

Events / 0.1 GeV

Reconstructed Neutrino Energy (GeV)

Audience: Theorists and experimentalists drawn from your subfield and related subfields

Content: Place your work in the context of your subfield as a whole. Provide some detail you think the audience will find interesting.

Language: Use language shared by experimentalists and theorists from your subfield that a beginning graduate student can understand.

Format: Your audience is in the room, talk to them!

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NOvA Preliminary

0.1 < |**q**|/GeV < 0.2

0.2 < |**q**|/GeV < 0.3

0.3 < |**q**|/GeV < 0.4

0.4 < |**q**|/GeV < 0.5

0.5 < |**q**|/GeV < 0.6

0.6 < |**q**|/GeV < 0.7

0.7 < |**q**|/GeV < 0.8

0.8 < |**q**|/GeV < 0.9

0.9 < |**q**|/GeV < 1

NOvA ND Data
MEC
QE
RES
DIS
Other

10^3 Events

Reco "q_0" (=$E_{had,vis}$)

NOvA Preliminary

2.85×10^{20} P.O.T.

NOvA ND Data

MEC

QE

RES

DIS

Other

Events

60000

40000

20000

0

0

0.2

0.4

0.6

0.8

1

Visible E_{had} (GeV)

Colloquium **~~Seminar~~** Research plan

"Job Talk Seminar"

Audience[*]: Theorists and experimentalists drawn from your subfield and related subfields

Content[*]: Place your work in the context of your subfield as a whole. Provide some detail you think the audience will find interesting.

Language[*]: Use language shared by experimentalists and theorists from your subfield that a beginning graduate student can understand.

Format: Your audience is in the room, talk to them!

Colloquium Seminar **Research plan**

Similar in most respects to the “job talk seminar” but you should address some specific questions:

- What are the important questions in your field?
- Which ones are you interested in and why?
- Why are these the important ones?
- How will your future research address these?
- What science do you expect to deliver in 3 years? 6 years?
- What do you expect your group to look like?
- What resources do you need? Which of them exist at the university / lab? Which will you need to bring in?

Story first

Story first

What ~three things do I want people to remember after my talk?

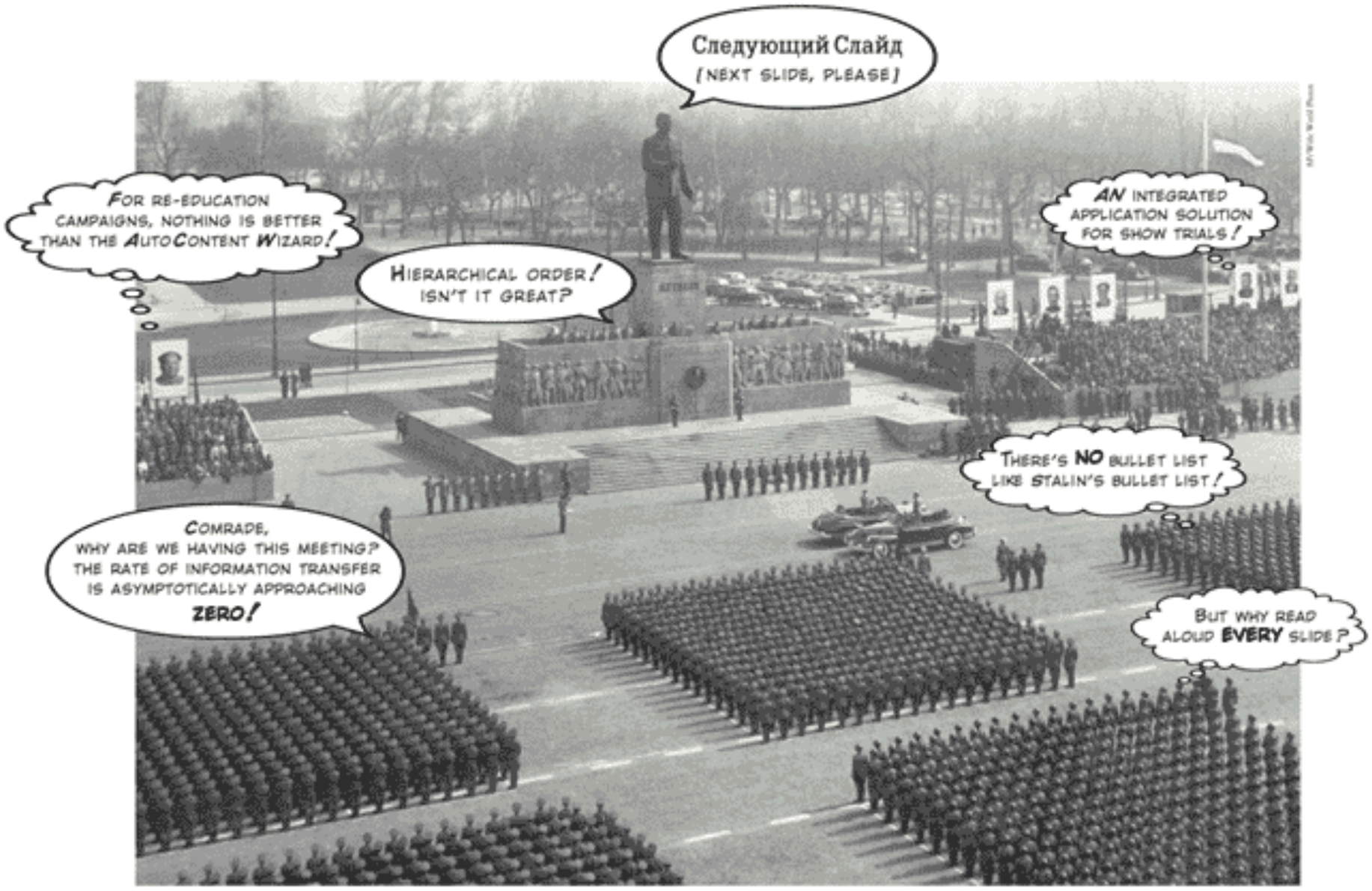
Story first

Start with words, not visuals

SECOND EDITION

Edward R. Tufte

The Cognitive Style of PowerPoint: Pitching Out Corrupts Within



Military parade, Stalin Square, Budapest, April 4, 1956.

https://www.edwardtufte.com/tufte/books_pp

Powerpoint is easy for presenter, hard for audience

"The traditional kind of corporate meeting starts with a presentation. Somebody gets up in front of the room and presents with a powerpoint presentation, some type of slide show. In our view you get very little information, you get bullet points. This is easy for the presenter, but difficult for the audience. And so instead, all of our meetings are structured around a 6 page narrative memo."

Jeff Bezos, Amazon.com

All meetings are structured around a 6 page memo

"When you have to write your ideas out in complete sentences, complete paragraphs it forces a deeper clarity."

Mechanics of the talk

Think of talk as three 15 minute units

Don’t go over time!

Face the audience and make eye contact

Make purposeful movements

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Showing your passion

Showing your passion

We exclude maximal mixing at 2.4σ!

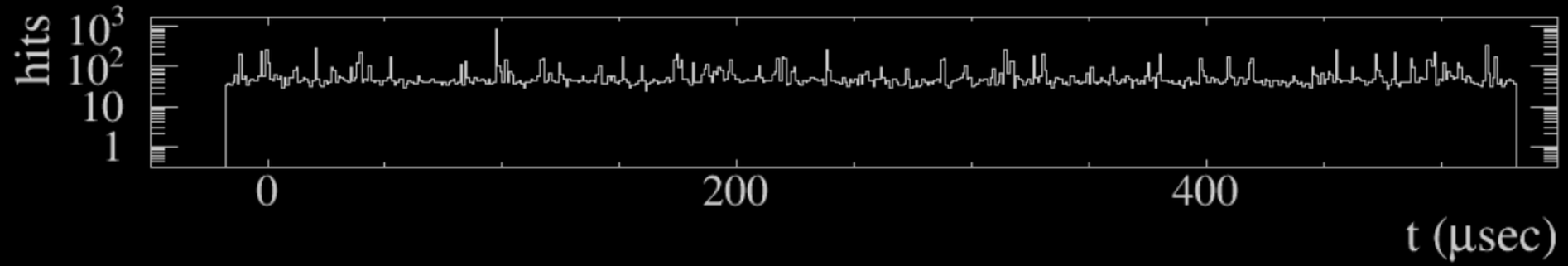
60 m

15.5 m

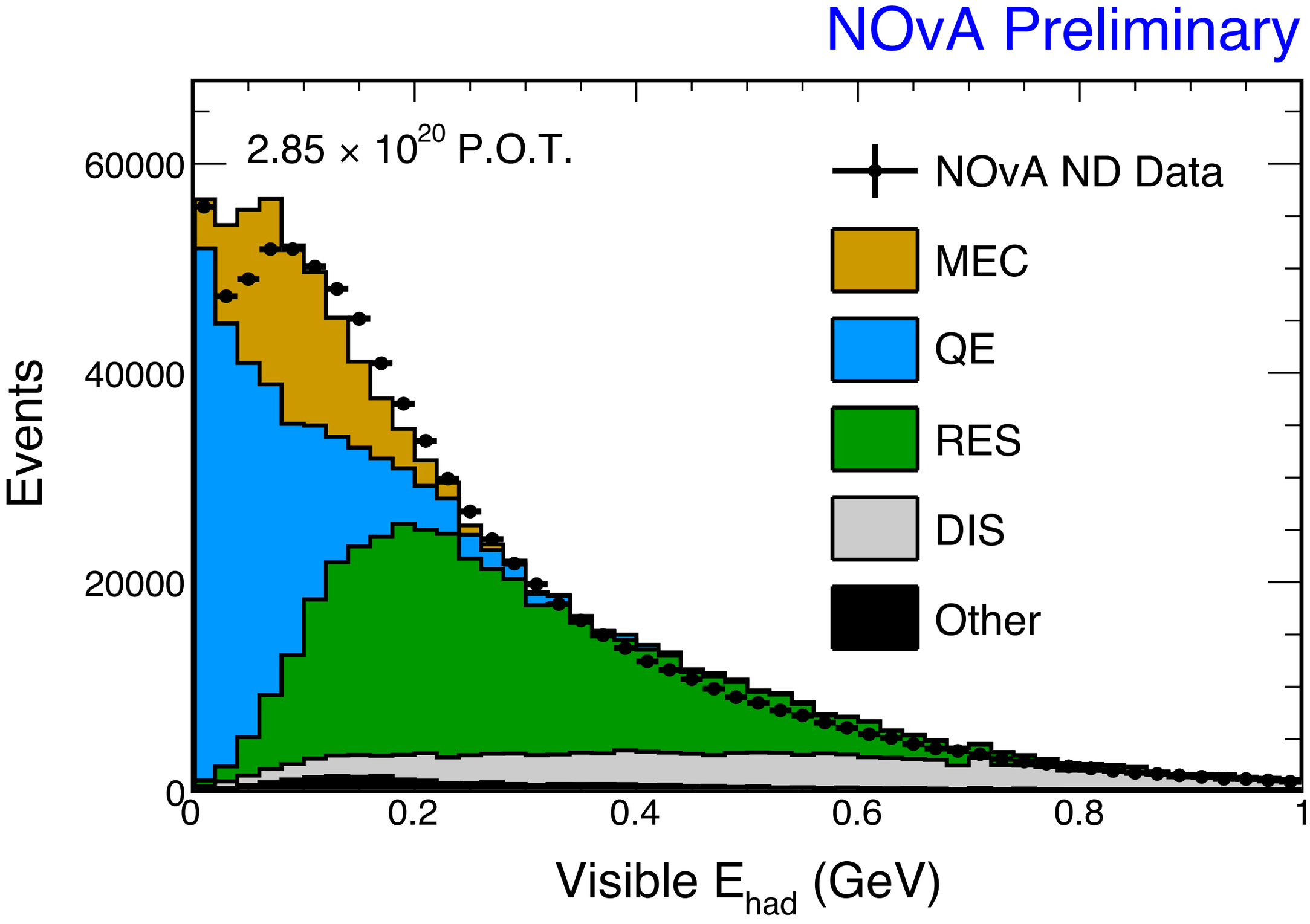
NOvA - FNAL E929

Run: 18605 / 0
Event: 161 / PerCal

UTC Tue Jan 6, 2015
23:25:55.172218000



Showing your passion



Teach: "You can get this"

Taking questions

Relax, listen to the questions

Prepare to avoid being blind-sided

Don’t fake it

Don’t engage with hostile questioners

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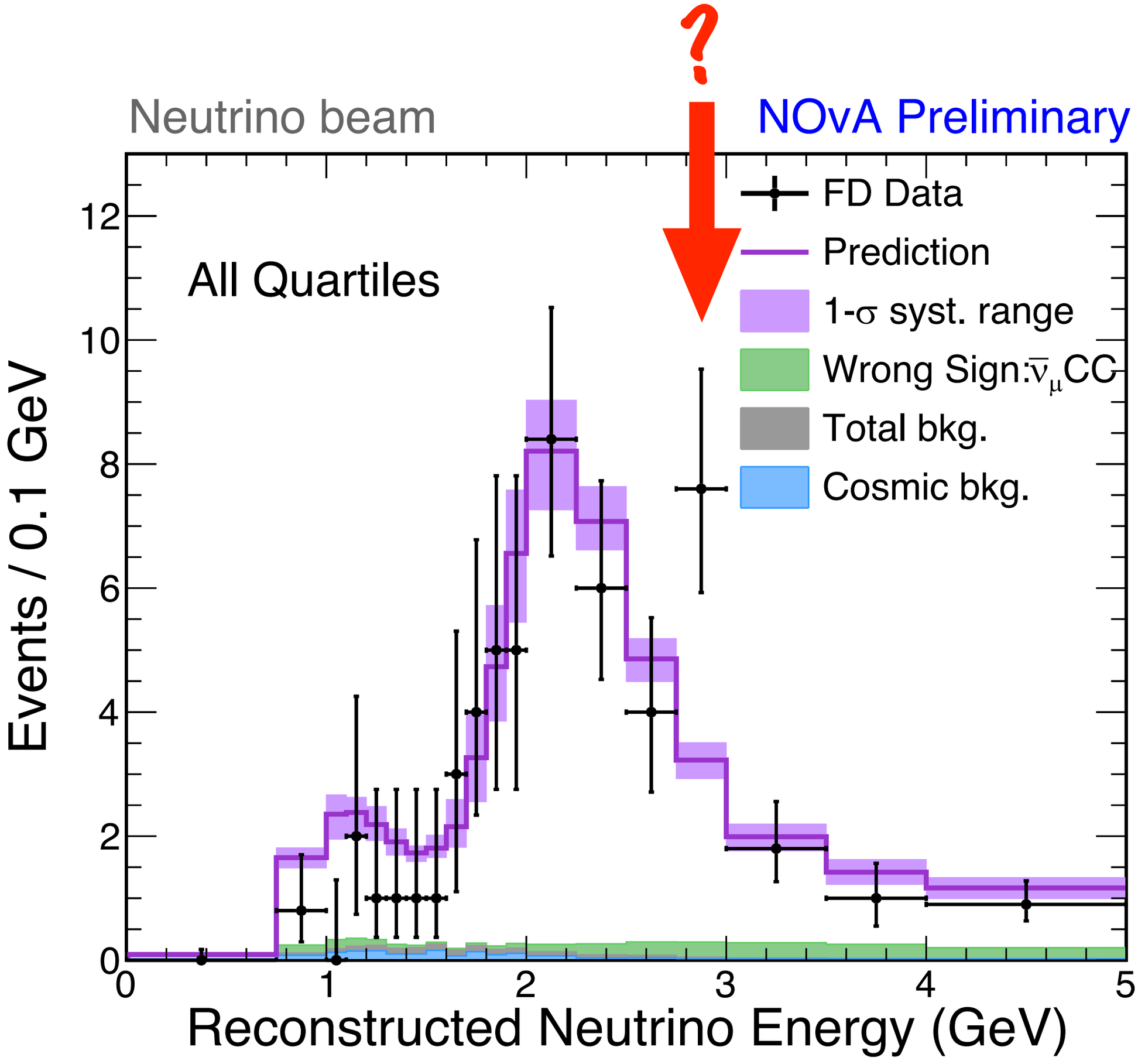
?
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Reconstructed Neutrino Energy (GeV)

Taking questions

High Energy Physics - Experiment

Authors and titles for recent submissions

[total of 54 entries: **1-25** | 26-50 | 51-54]
[showing 25 entries per page: fewer | more | all]

Thu, 13 Jun 2019

[1] arXiv:1906.05056 [pdf, other]

ATLAS Measurements of CP Violation and Rare Decays in Beauty Mesons

Wolfgang Walkowiak (On behalf of the ATLAS Collaboration)

Comments: 6 pages, 10 figures, Proceedings of the 2019 Conference on Flavor Physics and CP Violation (FPCP2019)

Subjects: **High Energy Physics - Experiment (hep-ex)**

[2] arXiv:1906.04963 [pdf, other]

Measurements of particle spectra in diffractive proton-proton collisions with the STAR detector at RHIC

Lukasz Fulek

Subjects: **High Energy Physics - Experiment (hep-ex)**; Nuclear Experiment (nucl-ex)

[3] arXiv:1906.04907 [pdf, other]

First measurement of neutrino oscillation parameters using neutrinos and antineutrinos by NOvA

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Practice and performance

Practice

Attend talks. Think about them critically.

Be physically prepared

Give the talk you want to give

Practice and performance

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Practice and performance

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Give the talk you want to give

Get a good night's sleep

>0.08 BAC = legally drunk

Table 6 Equating the effects of sleep deprivation and alcohol consumption

Test and measure	Hours (decimal) of wakefulness equivalent to BAC concentrations					
	BAC 0.05%			BAC 0.1%		
	Mean	95% CI	%*	Mean	95% CI	%*
Reaction time task:						
Speed (ms)	18.04	17.12 to 18.96	76	18.71	17.56 to 19.86	64
Accuracy (misses)	17.31	16.51 to 18.11	42	17.74	16.51 to 18.97	45
Dual task:						
Speed (ms)	17.73	16.75 to 18.71	84	19.65	18.58 to 20.77	67
Hand-eye coordination (level of difficulty)	18.43	17.41 to 19.45	79	19.42	18.40 to 20.44	58
Tracking task:						
Hand-eye coordination (level of difficulty)	18.25	17.37 to 19.13	74	19.01	18.91 to 19.97	61
Mackworth clock vigilance:						
Speed (ms)	17.08	16.20 to 17.96	82	18.10	16.85 to 19.35	58
Accuracy (misses)	17.64	16.72 to 18.56	68	18.80	17.93 to 19.67	76
Symbol digit task:						
Speed (ms)	18.55	17.43 to 19.67	50	18.91	17.92 to 19.90	48
Speed (symbols inspected (n))	18.52	17.46 to 19.58	57	18.64	17.65 to 19.63	79
Accuracy (correct (%))	16.91	15.72 to 18.10	41	18.39	17.01 to 19.77	42
Spatial memory task:						
Accuracy (length of recalled sequence)	18.05	17.09 to 19.01	86	17.88	16.92 to 18.84	64

~18 hours w/o sleep

*Numerator=number of subjects contributing data; denominator=number of subjects whose range of BAC incorporated 0.05% (n=37 or 38) or 0.1% (n=33).

Amount of sleep deprivation required to produce performance decrements equivalent to varying concentrations of blood alcohol (BAC), and the time of day at which the equivalence occurred in this study.

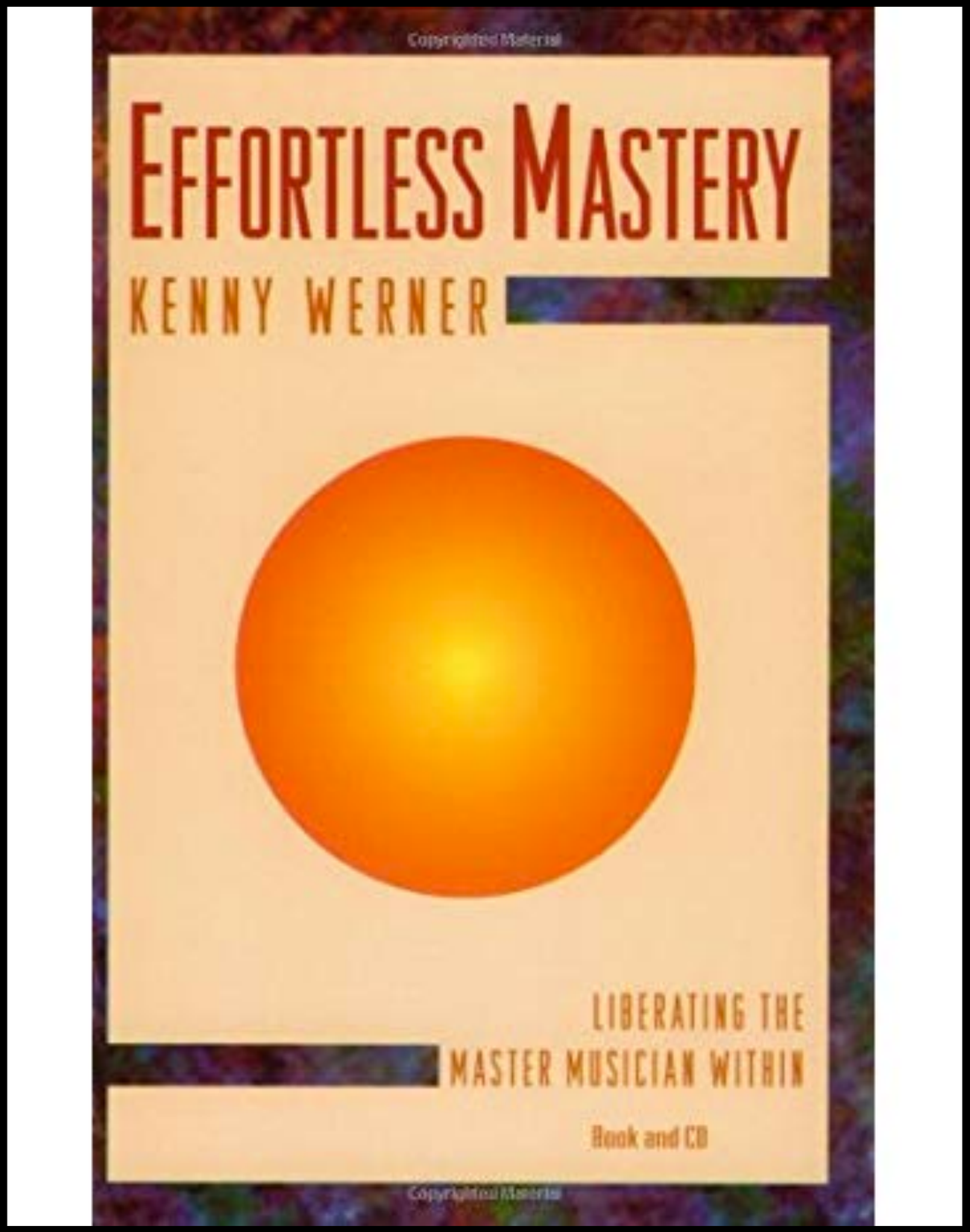
Practice and performance

Practice

Attend talks. Think about them critically.

Be physically prepared

Give the talk you want to give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EFFORTLESS MASTERY
KENNY WERNER
LIBERATING THE
MASTER MUSICIAN WITHIN
Book and CD
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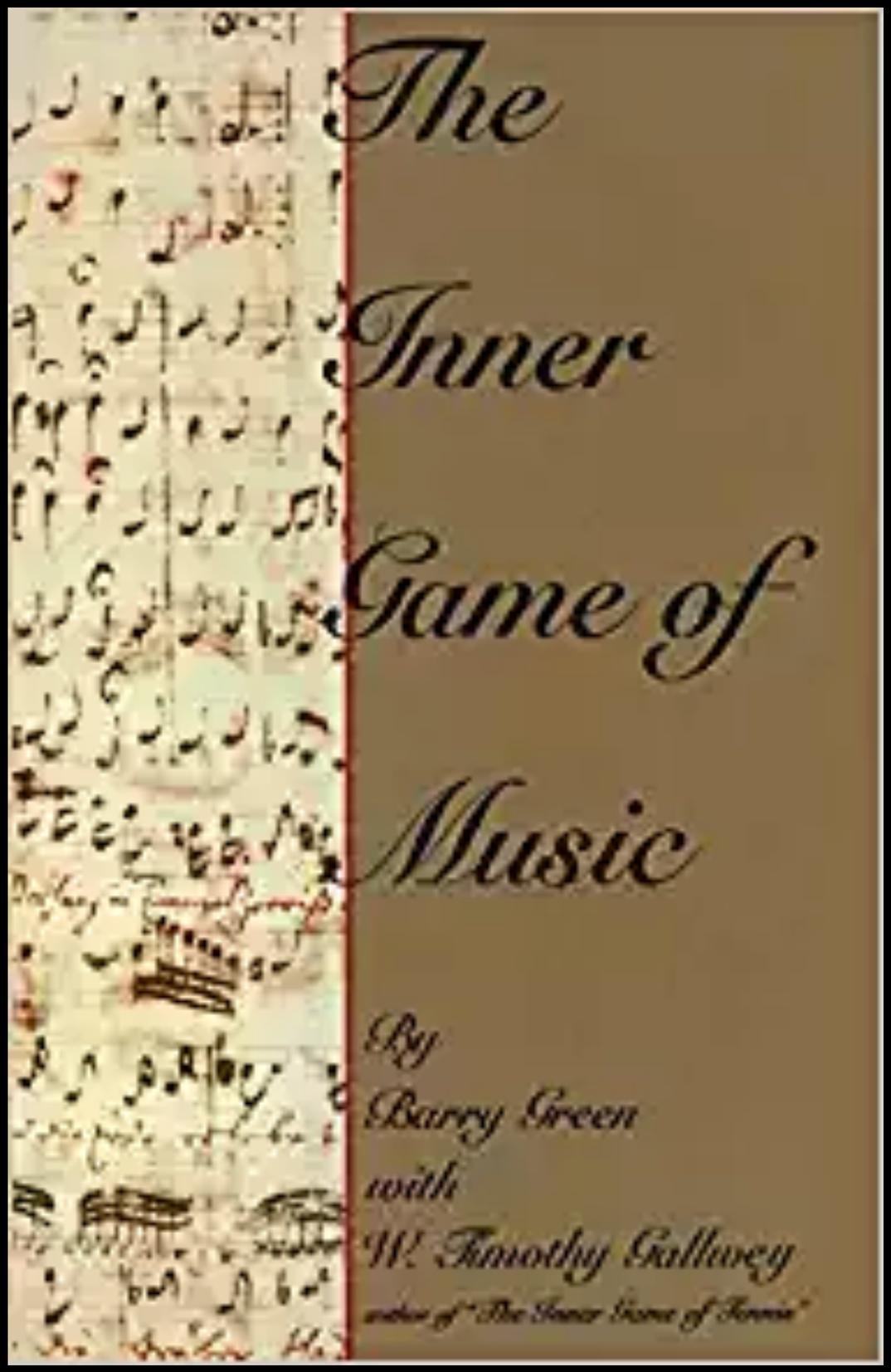
The
Inner
Game of
Music
By
Barry Green
with
W. Timothy Gallwey

Know your audience

Story first

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