

# Flash Talks



**First speaker: Leo**  
(just for warmup)

# The Hokie Bird



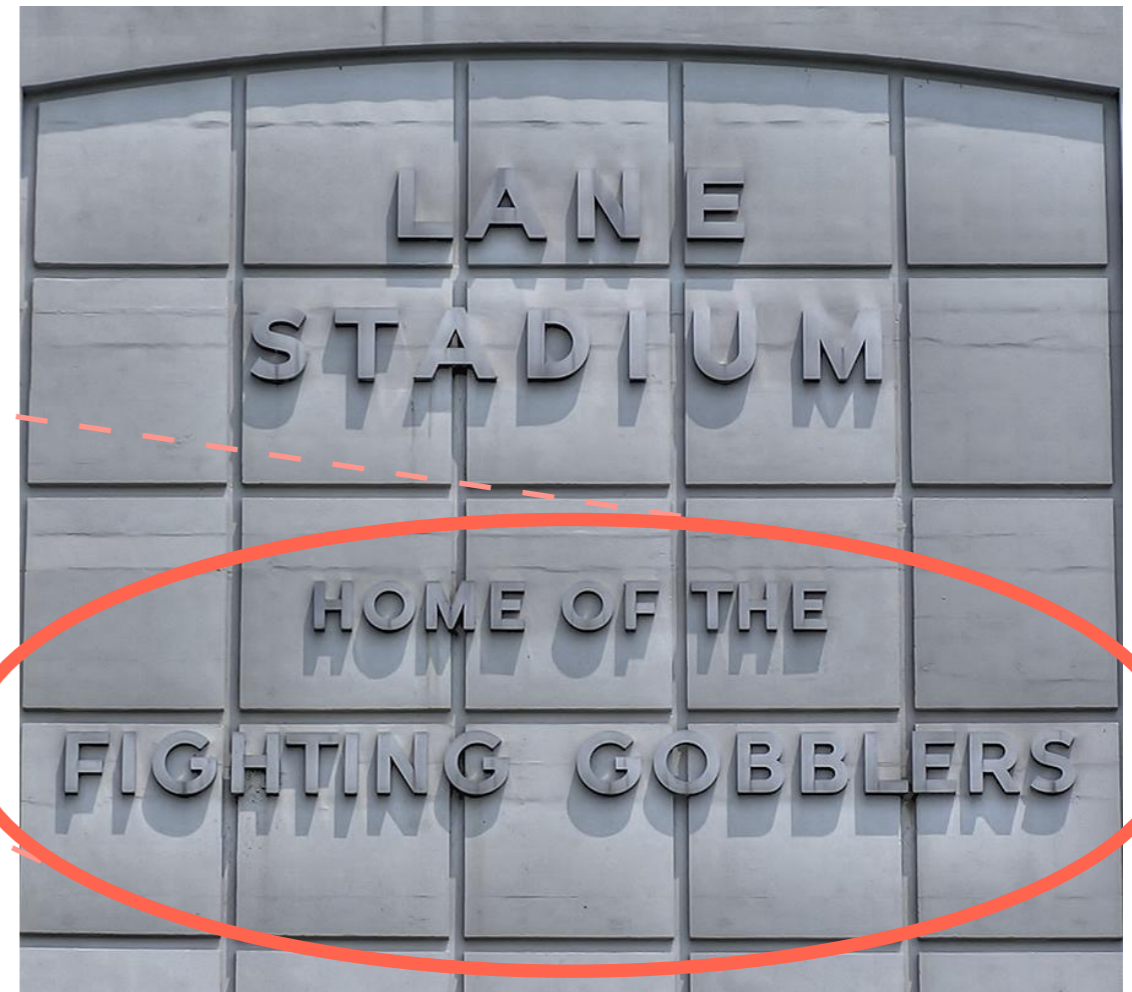
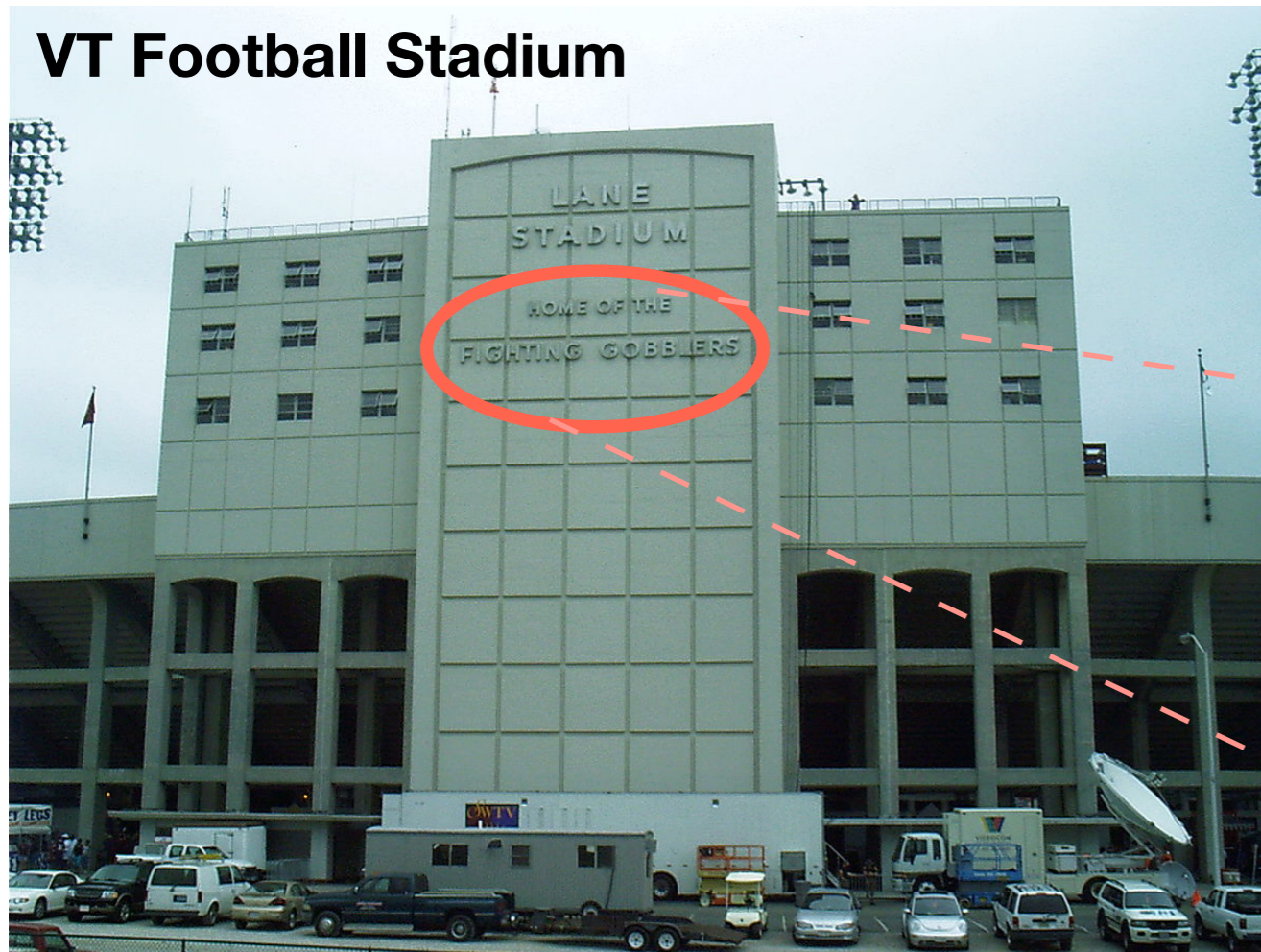
The HokieBird is the official mascot of Virginia Tech. The successor to Virginia Tech's Fighting Gobblers, the HokieBird was created in 1981 and has retained its current appearance since 1987. - *Wikipedia*

# The turkey

Early 1900s onward: the “Gobbler” became the most popular nickname for VT students and sports teams

*?? because of the way the hungry cadets gobbled down their meals ??*

**VT Football Stadium**



# The Hokie

Virginia Tech was one of the original “land-grant schools” in the US created around the time of the US Civil War. *Others: Iowa State, Texas A&M, Cornell, Purdue, MIT, ...*

*An aside: Virginia Tech was established for White students; Virginia State University was established at the same time for Black students.*

**In 1896**, the former Virginia Agricultural and Mechanical College (“Virginia A&M”) was renamed Virginia Polytechnic Institute (“VPI”).

A new school cheer was needed!

## Old (for VAMC):

Rip, Rah, Ree!  
Va, Va, Vee!  
Virginia, Virginia  
A - M - C!

## New (for VPI):

Hoki, Hoki, Hoki, Hy!  
Techs, Techs, VPI!  
Sola-Rex, Sola-Rah.  
Polytechs - Vir-gin-i-a!  
Rae, Ri, VPI!

*(\$5 prize for this winning entry)*

# The Combo

In 1981, the turkey-ish mascot was combined with the “Hokie” nickname.

**The HokieBird was born!**



When a senior who has (anonymously!) worn the HokieBird outfit graduates, she/he can wear the feet to the graduation ceremony.

**DO NOT** vote for

**Leo**

*Next speaker: Shuaiyan*

**Next speaker:**

**Shuaiyan**

# Belle II Summer School Flash Talk

Shuaiyan Kang

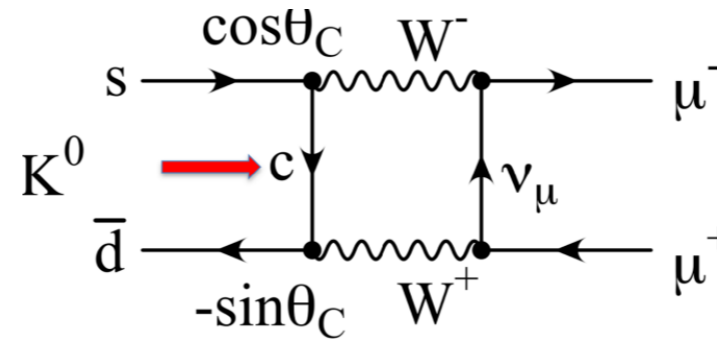
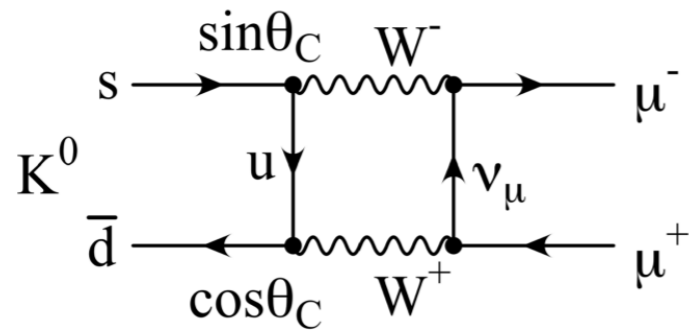
July 16, 2021



# What I learned

- Rare decays

- Flavor Changing Neutral Transition (FCNC), GIM Mechanism

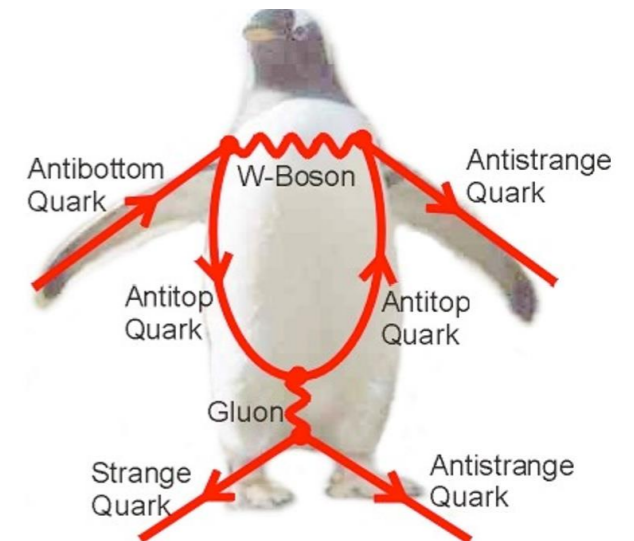
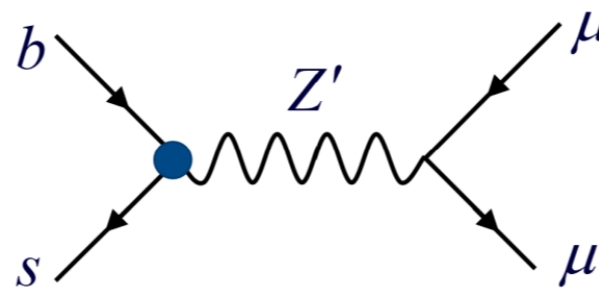
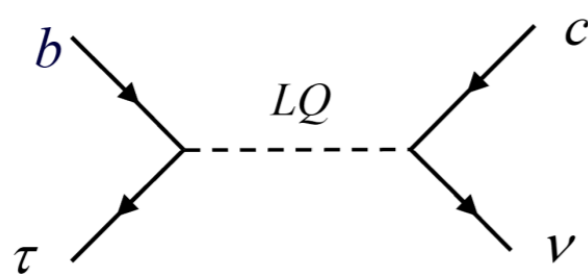


- Operator Product Expansion (OPE)

$$\mathcal{H}_{\text{NP}}^{\text{rare}} = \sum_{i=1}^{10} \frac{\tilde{C}_i(\mu)}{\Lambda^2} \tilde{Q}_i$$

- New Physics

- Leptoquarks,  $Z'$



Figures, diagrams from Browder, Crivellin, Takeuchi-san

# What I learned

- Belle II software
  - Gbasf2, grid
  - Read Belle MC using bbsview
  - Use variable collections
- Professional student Boot Camp
  - non-cognitive research skills
    - Technical awareness
    - Task/project organization
    - Communication



**THANKS**

Image credit: <https://ifera.org/>

Vote for  
**Shuaiyan**

... and ask questions!

*Next speaker: Dipta*

**Next speaker:**

**Dipta**

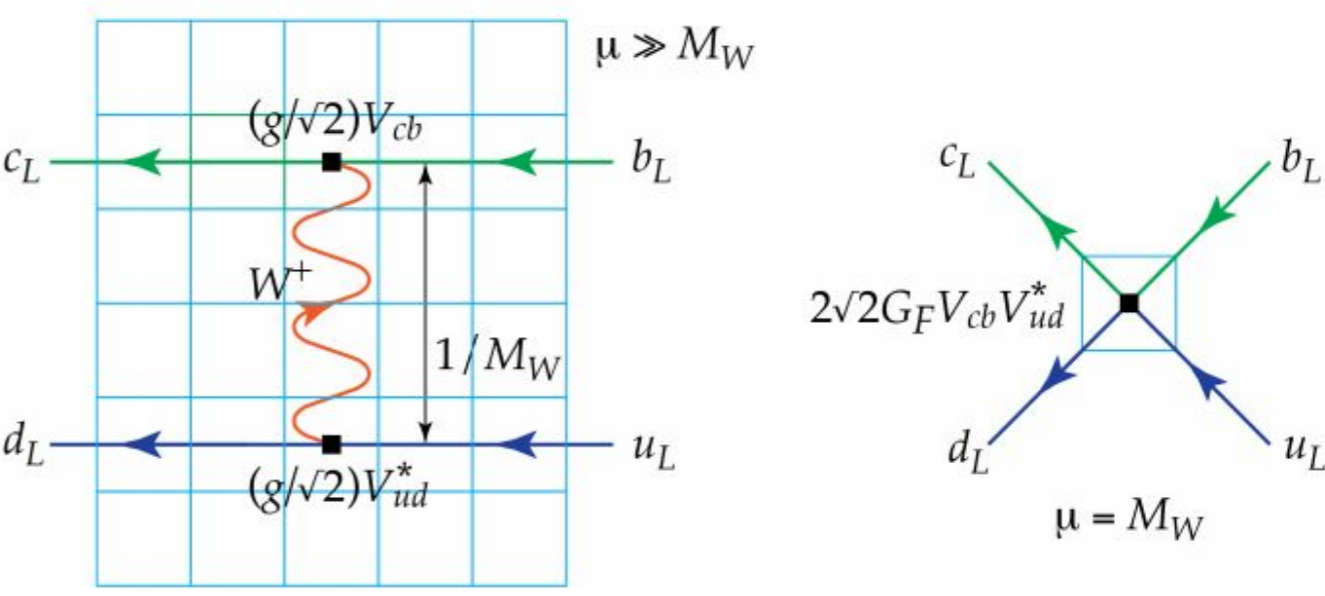
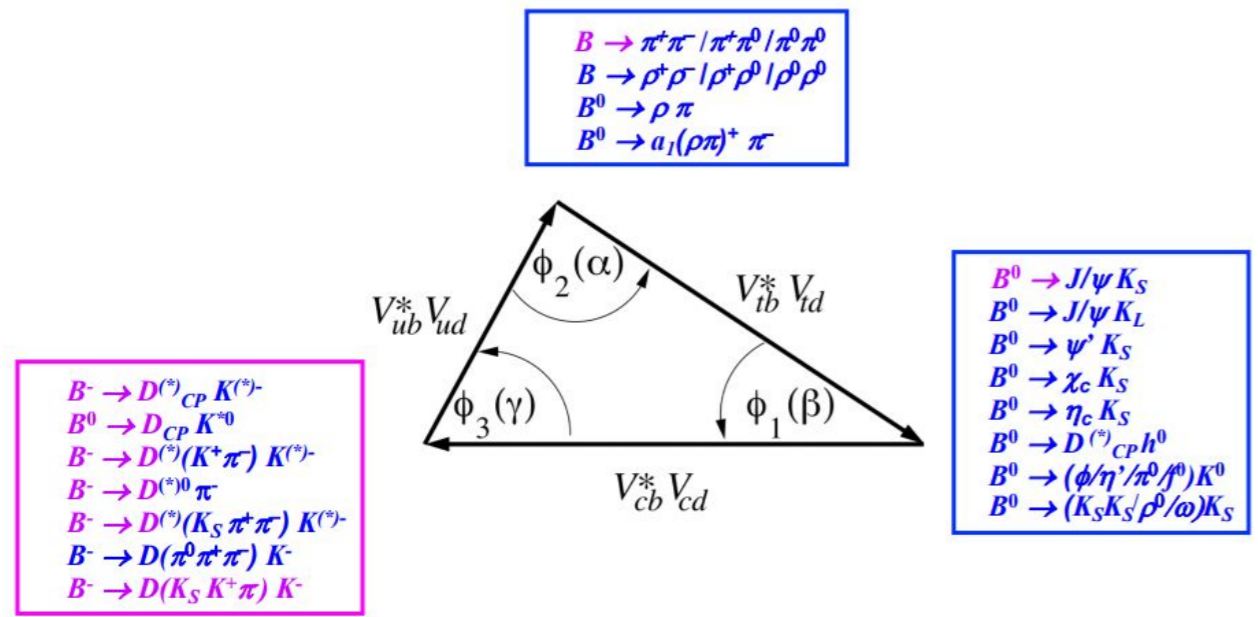
# Belle II Summer Workshop Flash Talk

Diptaparna Biswas



US Belle II Summer Workshop  
Virginia Tech (Virtual)  
July 16, 2021

# Theory lectures were engaging



The talks on CP violation and CKM matrix were accessible but interesting.

From the talk on Rare Decays, I learnt about Wolfenstein parameterization and Glashow-Iliopoulos-Maiani (GIM) mechanism.

The enjoyed the talk on Quantum Field Theory and Wilson coefficients a lot.

Built the concepts from the ground up!

The explanation of renormalization scale and operator product expansion was the most interesting part.

# Talks on Physics Analysis and Professional development

- Physics analysis talk from other graduate students and postdocs were encouraging.
  - Helped a lot in learning how to properly summarize and present a physics analysis.
  - Got a refresher of different analysis techniques.
  - The use of neural network and sPlot technique in the  $D_s^+ \rightarrow h^+ h^0$  analysis was interesting.
- The professional development session was also useful.
  - Summarized the challenges of graduate school and how to overcome them.
  - How to be more productive in research.
  - How to acquire communication and technical skills that goes beyond the grad school.

# Hands-on sessions

- The introduction to basf2 and the grid system was a nice refresher.
  - The use of `allowMultiRank=True` in combination with `numBest≠0` in the `rankByHighest()` function was new to me.
  - From Jan 2021, Belle II has started using Rucio as its Distributed Data Management software.
- The session on B2BII was interesting and I learned several new things.
  - How to convert Belle MDST files into Belle II format and the special case for FEI training.
  - Generating MC sample and running Belle detector simulation and reconstruction on it.
  - How to use `bbsview` to inspect the gen-level particle information per event in the MC sample.



**Vote for**  
**Dipta**

**... and ask questions!**

*Next speaker: Michelle*

**Next speaker:**

**Michelle**

# Mama Mia! Here we go again.



- 2nd time at Belle II summer school
  - Better understanding of physics concepts.
    - **Reviews I didn't know I needed**
    - **New concepts I didn't know**
  - Professional development for student session

# Challenge the limiting thoughts

## Activity 1: Are you limiting yourself?

Consider the reflective comments below. How often have you thought this yourself lately?

Enter an X on all that apply.

	<i>daily</i>	Weekly	Monthly	Rarely
If I do good work, they will notice and I will succeed.				X
They are important; I don't want to bother anyone.	X			
I should figure this out for myself		X		
I am looking for the perfect mentor				X
They are outside my discipline and won't help.			X	
I don't want to sound like I am self-promoting	X			
I only spend time with people I already know.		X		
I will talk/show them once I have something good.	X			
I wish I had better support		X		

*I ain't good*

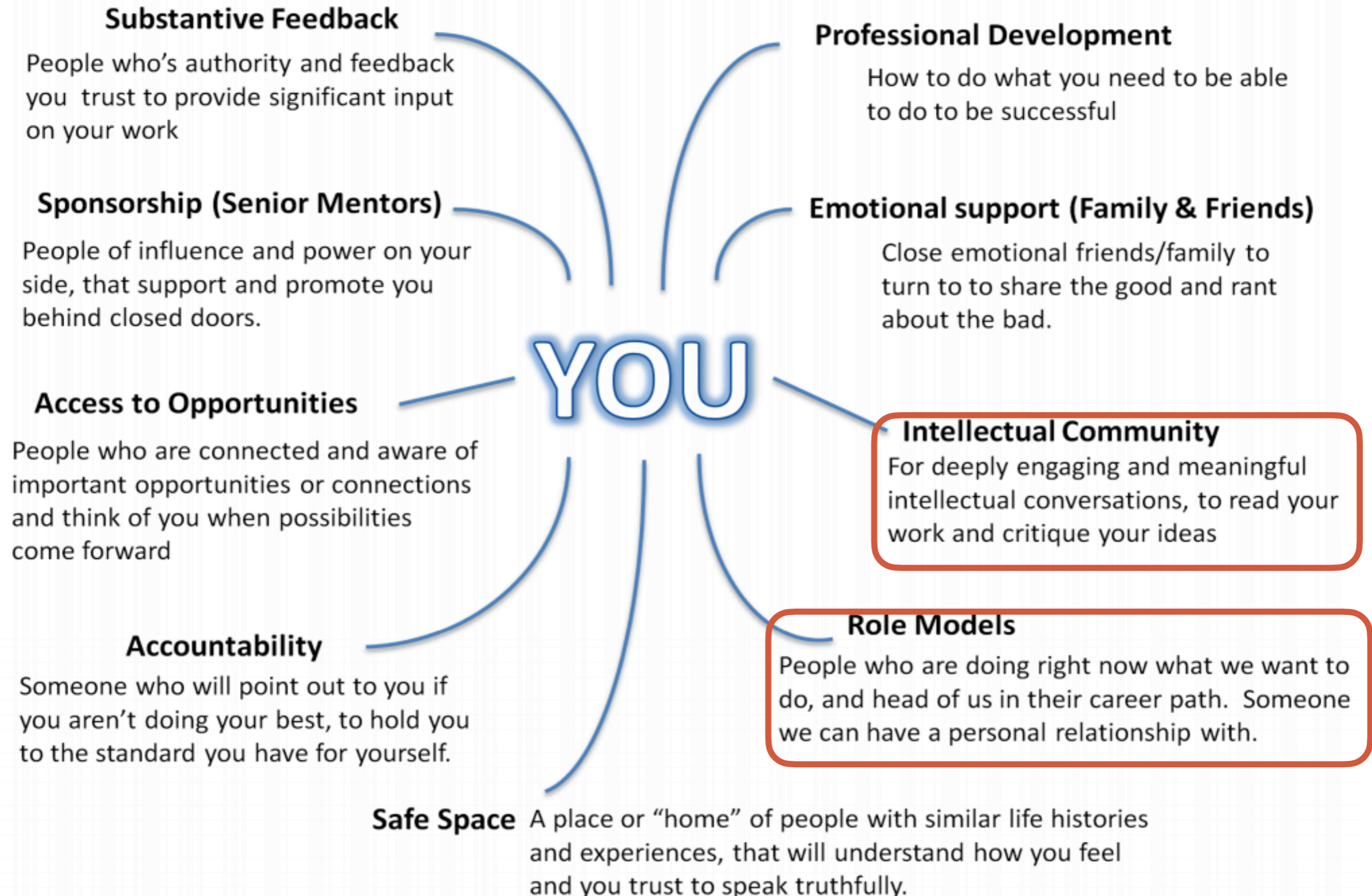
X



- I challenge myself to: reach out more for help and feedback

# Concept of Mentor Network

## An Effective Mentor Network



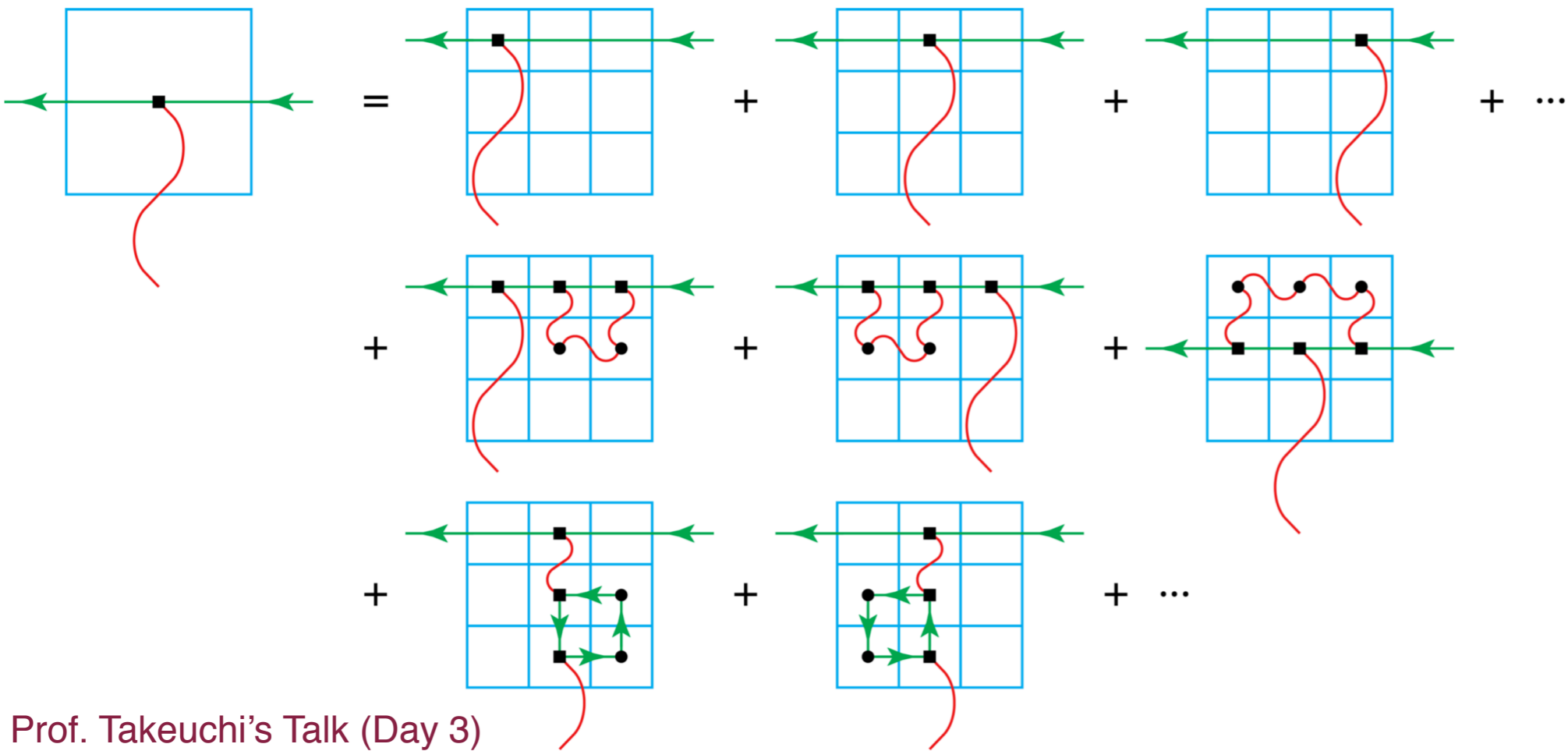
**Vote for**  
**Michelle**

**... and ask questions!**

*Next speaker: Tommy*

**Next speaker:**

**Tommy**



Prof. Takeuchi's Talk (Day 3)

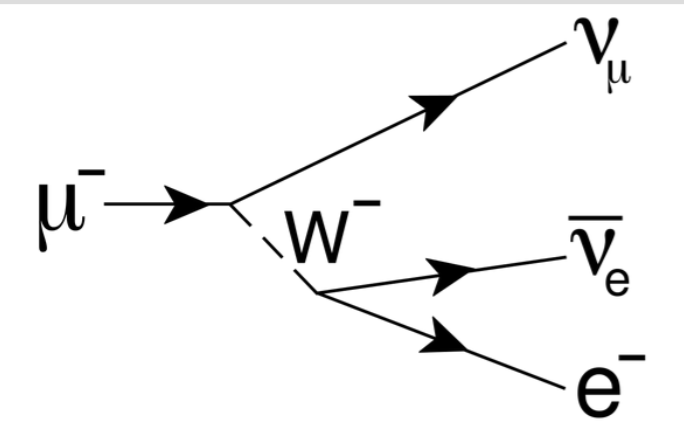


$$\mathcal{O}_1(x)\mathcal{O}_2(0) = \sum_i C_i(x)\mathcal{O}_i(0) .$$

# Operator Product Expansions in Belle 2



- Ex 1: At low energies, ( $\mu \ll M_W$ ),  $\Lambda \rightarrow M_W$  for SM (T. Takeuchi Slides Part 2 Slide 9)

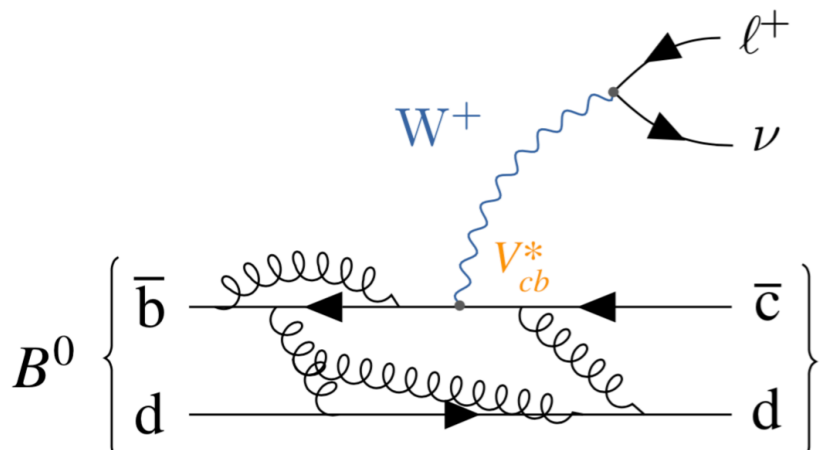


$$\frac{g^2(\mu)}{2} [\bar{e}_L(x_2) \gamma_\lambda \nu_{Le}(x_2)] \underbrace{\left[ - \int^\mu \frac{d^4 p}{(2\pi)^4} \frac{e^{-ip(x_2-x_1)}}{p^2 - M_W^2 + i\epsilon} \right]}_{W \text{ propagator}} [\bar{\nu}_{L\mu}(x_1) \gamma^\lambda \mu_L(x_1)] .$$

Zeroth order

$$2\sqrt{2}G_F(\mu) [\bar{e}_L(x) \gamma_\lambda \nu_{Le}(x)] [\bar{\nu}_{L\mu}(x) \gamma^\lambda \mu_L(x)]$$

- Ex. 2:  $\Lambda \rightarrow \Lambda_{QCD} \sim 1 GeV$  from A. Schwartz Slides (Slide 16) (related to CKM element calculation)



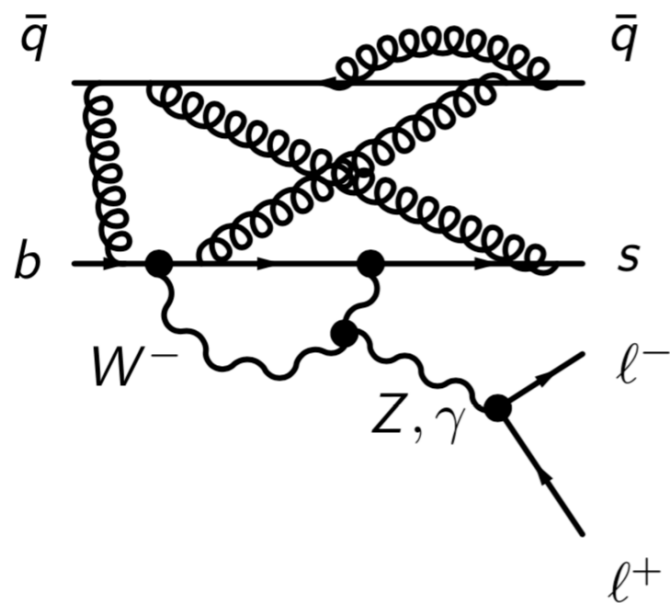
$$\Gamma[\bar{B} \rightarrow X_c e \bar{\nu}] \propto |V_{cb}|^2 g(m_c/m_b) \left[ 1 + \frac{\alpha_s}{\pi} p_c^{(1)}(m_c/m_b, \mu) + \mathcal{O}(\alpha_s^2) \right] + \dots$$

[Gambino and Schwanda PRD 89, 014022 \(2014\).](https://arxiv.org/abs/1402.0140)

[Y. Amhis et al. \(Heavy Flavor Averaging Group\), EPJC 81, 226 \(2021\).](https://arxiv.org/abs/2102.0226)

Eq: see <https://arxiv.org/pdf/0805.0271.pdf>

- Ex 3.  $b \rightarrow sll$  (A. Sibidanov hands-on session Day 3) and T. Browder's Slides (Slide 34) (Relevant for FCNC and NP)



$$A_{FB}(B \rightarrow K^* \ell^+ \ell^-) = -C_{10} \xi(q^2) \left[ \text{Re}(C_9) F_1 + \frac{1}{q^2} C_7 F_2 \right]$$

- Also mentioned in A. Crivellin's talk on Flavor anomalies (slide 9, 14, ...)
- I'm sure there are more places I'm missed but hopefully, I captured the fact that we've seen it quite a bit throughout the summer school!

**THANK YOU VERY MUCH!!**

Vote for  
**Tommy**

... and ask questions!

~~Next speaker: Rishabh~~