

From Stead to Singapore: Building a new way to learn



C. Frank Starmer
Duke-NUS Graduate Medical School
Singapore &
Duke University

Our Objective: To embed Stead themes throughout Duke-NUS

- **Everyone is a learner**
- **Learn through doing and explaining**
- **Know what you don't know**
- **Reinforce learning with repetition**
- **Visual thinking / communication**
- **Identify patterns and deviations from patterns**
- **Team-based problem solving**
- **Extend brain memory with Internet memory**

Gene's marching orders.

Behind the scenes pot stirring by Gene: an excerpt from a note to Ellen

I have always admired Frank for his independence and his willingness to enter new ventures. Along the way he has become a superb mentor and an inspiration for many young people.

The word is his for grasping. I've urged him to stop & plan for the next thirty years. He needs to find a liberal college where he can spend the rest of his life inspiring young people. Put him to work. I will lead the cheering section.

Gene Steeb.

April, 2003

Fortunately, Sandy Williams provided something better than a liberal arts college: Duke- NUS GMS

An engineer in a clinical dept: The 30+ year Stead, Wyngaarden and Greenfield STP

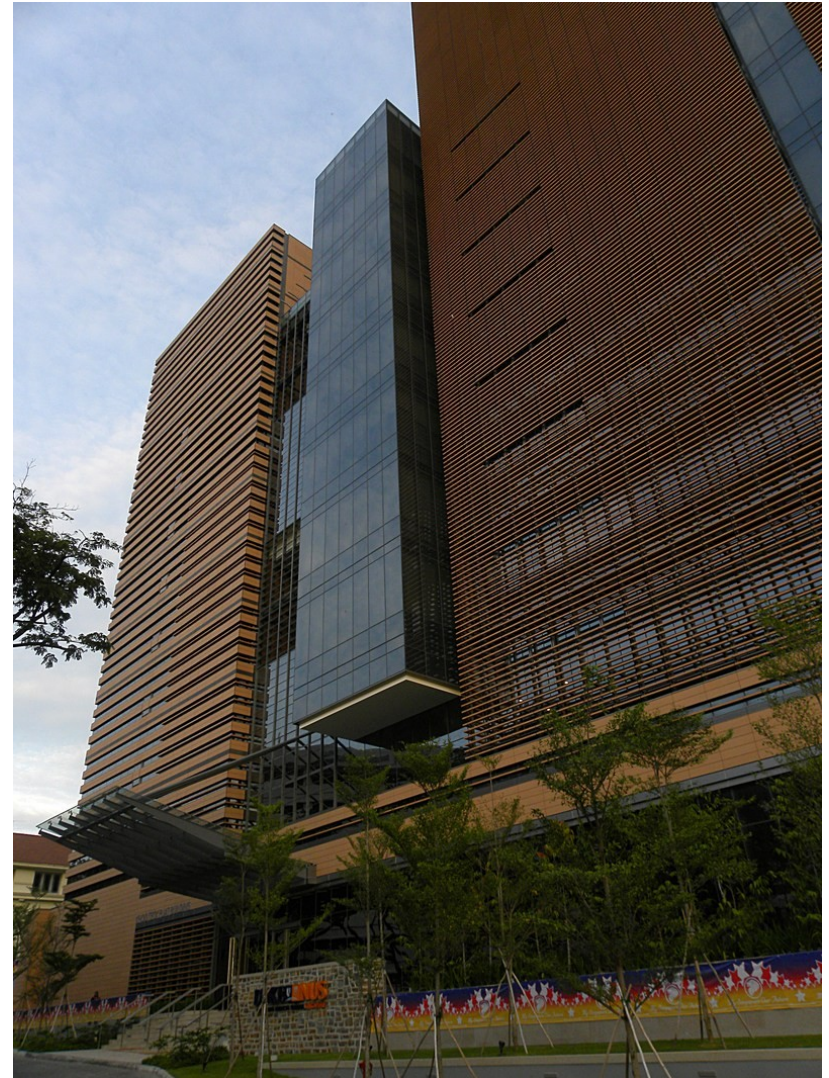
- 1959-1965: Undergraduate and MS EE student, worked for TelCom in Duke South
- 1961: Henry McIntosh, Tommy Thompson, Bob Whalen and Jim Morris (Cardiac Cath Lab)
- 1963: John Moore exposes me to quantitative neurobiology (Basic Science)
- 1965: Gene “encouraged” me to leave. If I was “any good”, he would invite me back
- 1967: Stead “People Chemistry” experiment, 1st PhD in the Dept of Medicine
- 1969: Grizzle, Starmer Koch. Biometrics 25:489-504, 1969 (Biostatistics)
- 1969: Harley, Starmer, Greenfield. J Clin Invest. 48: 895–905 (Clinical Science)
- 1969-1980: Built the IT infrastructure for the Cardiology Databank
- 1970: Gene gave Ellen the keys to his place at Kerr Lake (Life Balance)
- 1971: Established the Computer Science Dept (Computer Science)
- 1972-1977: Learning medicine: Physical Diagnosis (Galen) + Osler rounds (Gene)
- 1973: Sperling, Wyngaarden, Starmer: J Clin Invest. 52:2468–2485 (Translational Medicine)
- 1975: McNeer, Wallace, Wagner, Starmer, Rosati Circulation 51:410-413 (EBM)
- 1981-2005: Joe Greenfield sent me to work with Gus Grant: Antiarrhythmic drugs
- 1985: Starmer and Grant: Mol. Pharm 28, 348-356 (Basic Science)
- 1987-2002: Collaborative research in USSR / Russia (Multiculture Lessons)
- 1993-94: Visiting Prof at Indian Institute of Technology, Madras, India (Multiculture Lessons)
- 1997: Completed Singapore Training Program
- 1998: Fulbright – Univ Patras, Greece (Multicultural Lessons)
- 2006 - ?: Unretired from Duke to execute Gene’s and Sandy’s marching orders

The Challenge



From March 2006

To March 2009



Transforming Medicine, Improving Lives

The surface agenda: Sandy's marching orders

Pat Casey, Bob Kamei, Sandy Cook, Ed Buckley and you have 16 months to build a successful and competitive learning program from the ground up

We had to:

- Build learning spaces (large learning room, clinical practice rooms, laboratory, lounge)
- Implement the Duke curriculum: Adapting the Duke curriculum to the Singapore context: Team-based learning modeled on teaching rounds with Dr. Stead on Osler
- Recruit a faculty
- Become known to potential students
- Deal with uncertainty: Will there be applicants? Will there be completed applications. Will we recruit a world-class faculty? Can we build a learning strategy reflecting the way we would like to have learned? And finally, what about Naomi?
- Maintain balance: address the requirements of Ministries of Health, Education, Finance and Trade and Industry, A*STAR (Agency for Science, Technology and Research) and Duke
- Build a partnership with SingHealth (Singapore General Hospital and KK Women's and Children's Hospital)
- With SingHealth, develop the Outram academic campus
- Design, construct and debug our new building

The Stead themes: our hidden agenda:

- A flat structure: Everyone is a learner. Traditional students are junior learners, faculty are senior learners
- A learner-centric pecking order:
 - 1st Students
 - 2nd Everyone else
- Internet-centric learning
- Crescendo-like transition from university to medical school to housestaff to professional life
 - First weeks of school = Foundations, not Orientation
 - Developing young people, neither educating nor teaching
 - Team-based administration (Ranga's influence, balanced score card)
 - Promote and enable flexible individual learning styles
 - Laptop neutral (Windows, Mac, Linux)
 - Open learning resources (Internet accessible)
 - Embrace portable media (USB disk, iPhone and iPod touch)
 - Mastering MFU concepts (reduce exposure to the forgetting process)
 - Our internal objective: To out-Duke Duke

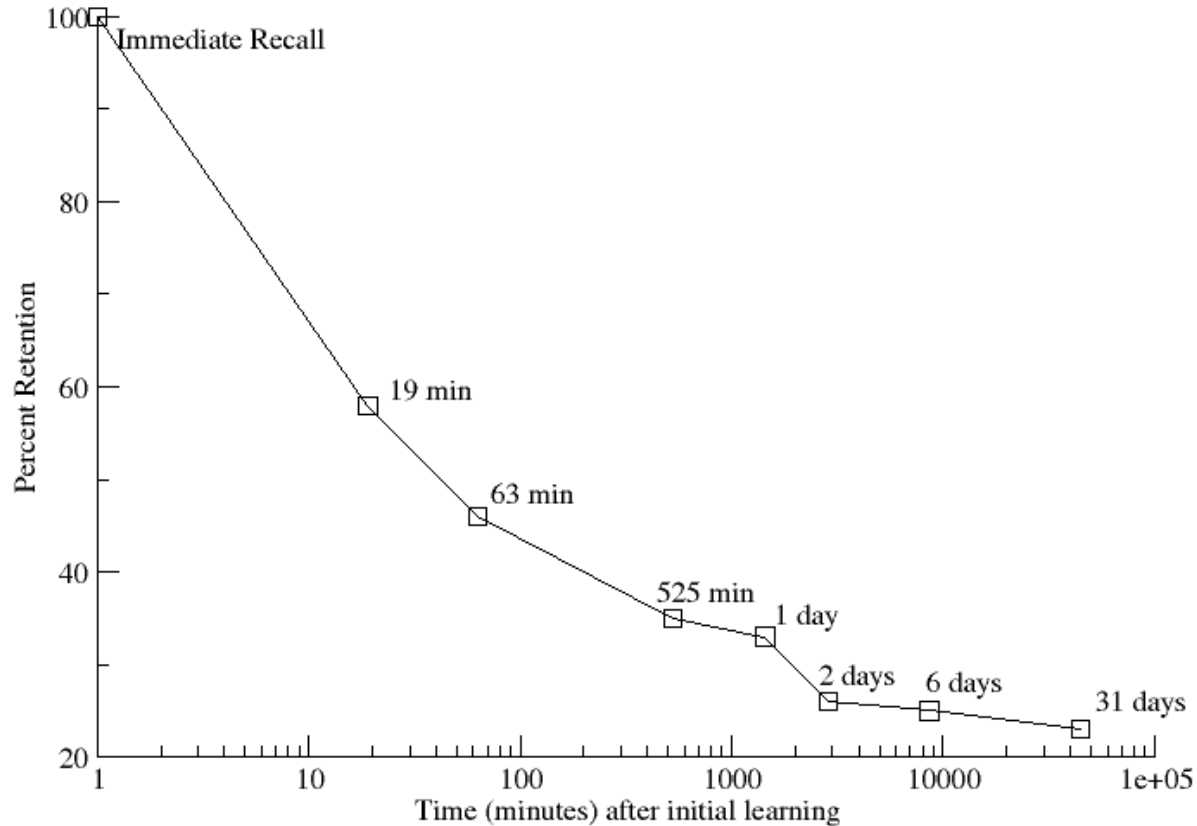
Foundations of our program:

- Culture matters – encourage respectful questioning
- Team-based learning
- Ignite curiosity: a major driver of learning
- Engineering approach to problem solving
- Awareness of the neurobiology of learning and forgetting:
- Drive the curricular content by a what-we-do model: Mastery of the 80% concepts and information we use daily – exposure to other 20%
- Use Google and Internet resources as a memory extension
- Learning episodes designed to avoid the forgetting curve

Characterizing forgetting

The time course of forgetting

Source: Hermann Ebbinghaus, *Memory: A Contribution to Experimental Psychology*, 1885



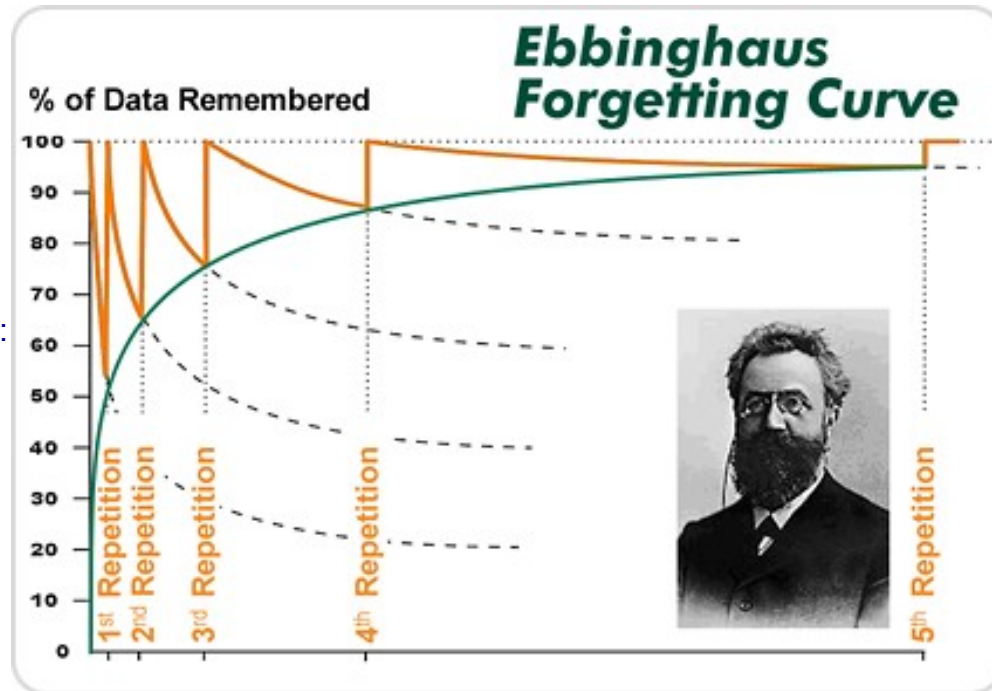
Studies of Learning and Forgetting

Ebbinghaus, *Über das Gedächtnis (About memory)*, 1885

Repetition: reinforcing accurate recall of learned material

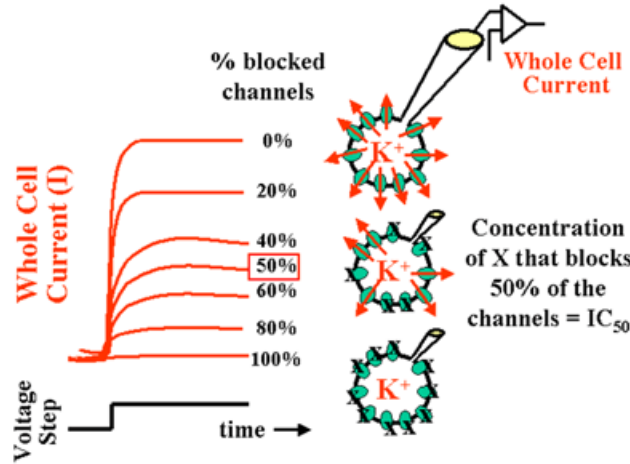
Retention is exponentially related to time, t, and strength, S:

$$R = e^{-\frac{t}{S}}$$

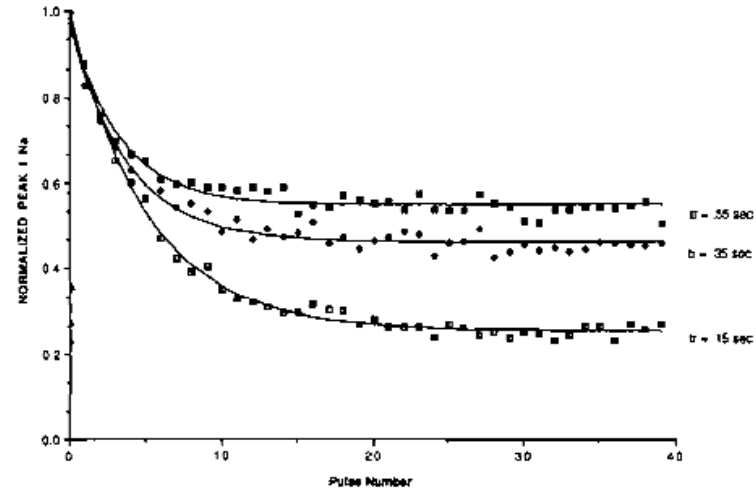


Learning with Gus: Cardiac Cells can learn and forget

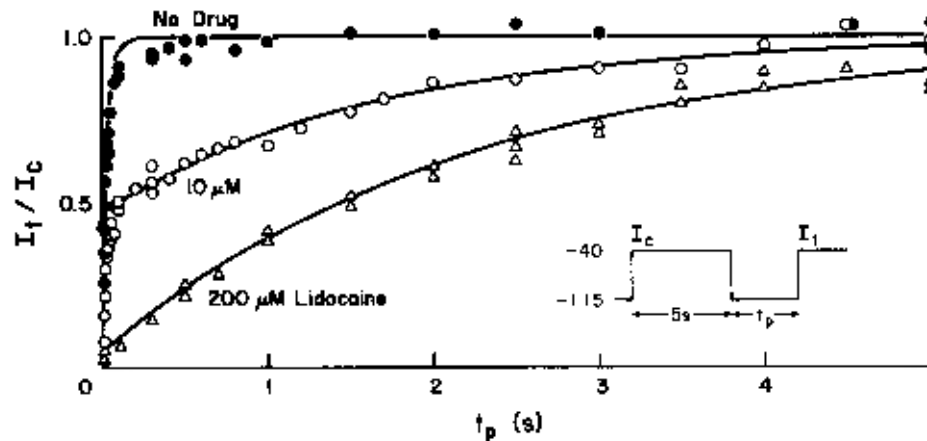
Gold Standard Assay: Whole Cell Voltage Clamp



734 *Circulation Research* Vol 65, No 3, September 1989

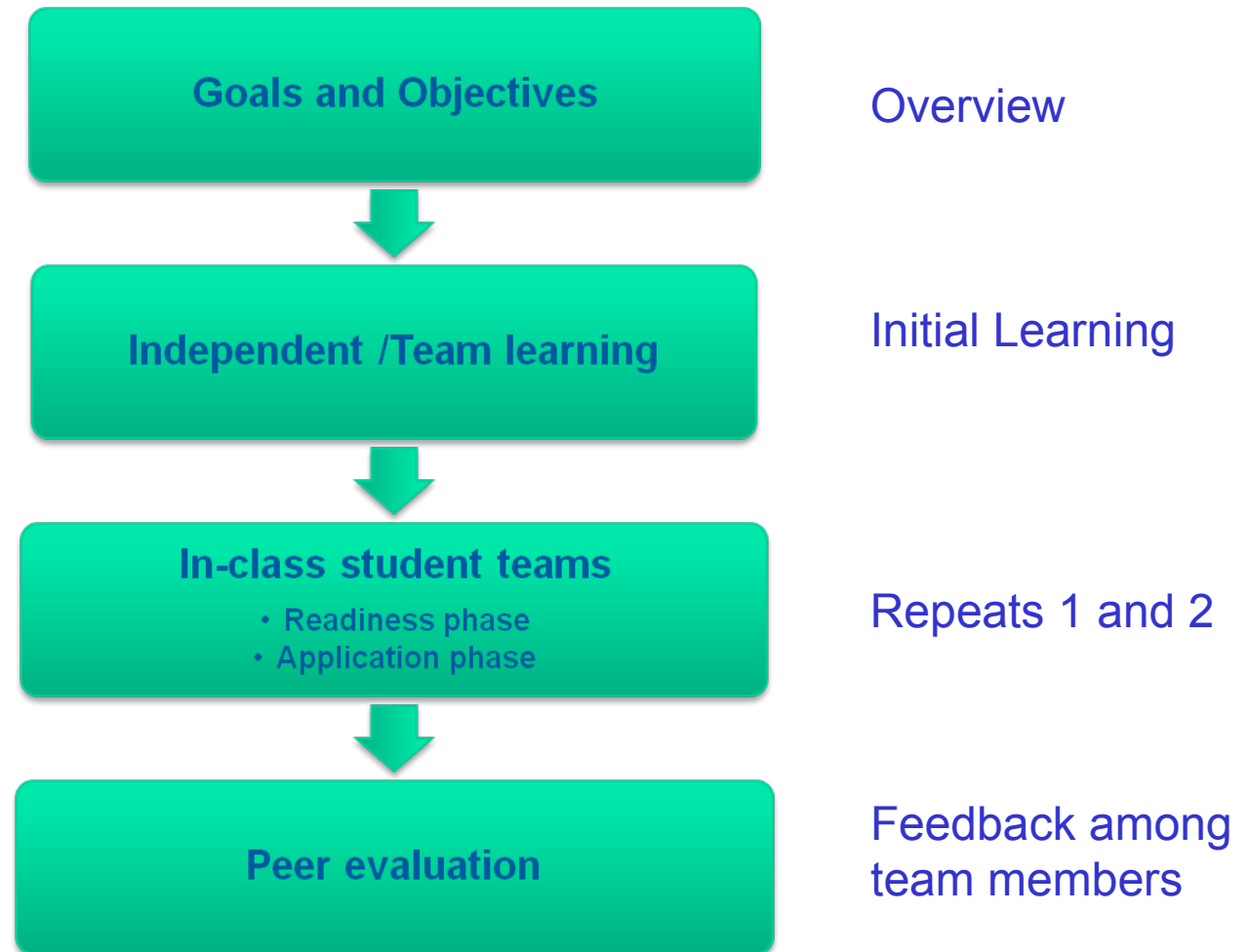


Cardiac Learning



Cardiac Forgetting

Our Program: Team LEAD (Learn, Engage And Develop)



First year goals:

Fact and Concept Acquisition (memory)

- Traditional emphasis for medical schools
- Guided Independent learning
- Individual learning style

Information Processing (thinking)

- Making conceptual connections, solving problems, explaining to others, knowing what you don't know
- TeamLEAD

Osler Rounds = Team-based learning

	Osler Rounds	TeamLEAD
Prework	Patient assigned, perform Hx + PE. Books and journals to identify differential and prepare for Dr. Stead	Review faculty developed goals / objectives. Learning focused by module learning resources
Readiness Phase	IRA: Questions around the bedside. GRA: Discussion in the resident's office (maybe a nickel on the blackboard)	IRA: Multiple choice questions GRA: Team reviews questions and submits consensus answers
Application Phase	Developing patient care plans	Applying learned concepts and material to questions derived from a clinical problem

Curriculum Overview

Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Foundations Physical Exam Skills Learning/Critical Thinking	Molecules & Cells (6.5 wks)		Normal Body (11.5 wks)		Vacation	Brain & Behav (4 wks + Chinese NY)		Body & Disease (20 wks)		Break	Body & Disease	
	Practice course 1 and					Investigative	Physical Exam Wk	Methods and			Tools	Assessment Wk

Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug		
OCY & Clinical Core 1	8-week block (Includes Mid and end of clerkship evaluations)		Clinical Core 2	8-week block (Includes Mid and end of clerkship evaluations)		Vacation	8-week block (Includes Mid and end of clerkship evaluations)		Clinical Core 3	8-week block (Includes Mid and end of clerkship evaluations)		Clinical Core 4	8-week block (Includes Mid and end of clerkship evaluations)	
	Practice Course 2													

Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Planning for 3rd yr	Research Year				Vacation	Research Year				Break	Research/Elective/Break	
	Family Medicine Clerkship											

Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	
Sub I	ER/ICU	Ortho/ Gen Surg/ Elective	IM/ Elective	Interviews/ Vacation	Elective & Clinical Skills Exit Exam		Elective	Elective / Match	Elective	Capstone	GRADUATION	Break	Residencies Begin
					Practice Course 4								

Transforming Medicine, Improving Lives

Internet-centric learning

Search for

Logged in as **C. Frank Starmer**
Your password expires in 61 days

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Worktable updates - RSS
[View all available RSS feeds](#) for student worktable updates.

RSS feeds
[What is RSS?](#)
Move mouse over each item to see details.
Click on the buttons to view other feeds, or choose one from the list.

NEJM - Image of the Week

NEJM - Image of the Week

- Pachyderma
- Cerebrospinal Fluid Leak
- Diagnostic Finding in the Iris
- Uvular Endos
- De Gai
- Giant C
- Unilate
- Pneum
- Coli
- Esoph
- Tortuo
- Chroni



A 51-year-old woman was found to have a small, pinkish tumor of the left iris (Panels A and B, arrows). The visual acuity was not affected, and the intraocular pressure was normal. A tumor of ...

Events for 11th of October, 2009

Announcements | **Seminars** | **Course Info** | **Looking ahead**
Timetable | **Student Affairs** | **Duke USMLE** | **Duke Materials**
Course File Mgt | **Directory** | **Duke BlueDocs** | **Learner's wiki** | **Wiki**
Files
BlueDocs filesort | **Resources**

Announcements

Administrators note -
Gray announcements are not active
Blue announcements are postdated (not active).

- MOH Blog entry on American Residency model**

The Singapore Ministry of Health (MOH) has published a blog entry by Prof Chee Yam Cheng on the Minister for Health blog. He discusses the American residency system and the benefits it can bring. The links are as follows:

- Prof Chee's entry on Minister for Health blog:
<http://mohsingapore.blogspot.com/2009/10/good-but-we-can-be-better-new-pathway.html>
- MOH Facebook page:
<http://www.facebook.com/pages/Singapore/Ministry-of-Health/154909330630>

MOH would also like to welcome any comments, questions and suggestions from students in response to this entry. Students can post their comments, questions and suggestions to the MOH Facebook page (see [link above](#)).

[\(Edit\)](#) | All | Feed enabled)

Today's date: 11 Oct 2009

<	Oct	>	2009	>			
	Mo	Tu	We	Th	Fr	Sa	Su
39	28	29	30	1	2	3	4
40	5	6	7	8	9	10	11
41	12	13	14	15	16	17	18
42	19	20	21	22	23	24	25
43	26	27	28	29	30	31	1
44	2	3	4	5	6	7	8
<input type="button" value="Clear"/>							

Links

Learning Resources

- DimDim - Join meeting
- DimDim - Start a meeting
Requires login
- NUS Sharepoint
- Duke-NUS Sharepoint
- Bacus virtual microscopy (Requires Java)
- US NIH PubMed via NUS
Requires NUS login to download journal pdfs
- NUS E-Journals (Requires NUS ID)
- NUS Library
Sign in to access other journal sources.
- Exam Master Online
- USMLEasy
- Library and Web Links:
NUS e-journals, e-Textbooks
- Duke E-Journals (PDFs require Duke NetID)
- US NIH PubMed Entrez (direct) No login required
- TeamLEAD Learner's Wiki
- Duke-NUS Students' Wiki

Directory Services

- Duke-NUS Directory
- Duke Departmental Links
- NUS Yong Loo Lin School of Medicine

Duke-NUS Support

Anywhere – anytime access

September 17, 2009, Thursday, 259

gmscfs | My talk | My preferences | My watchlist | My contributions

Go Search

DUKE NUS
GRADUATE MEDICAL SCHOOL SINGAPORE

Student Help Wiki

Igniting the Pioneer Spirit

Navigation

- Main Page
- Community portal
- Current events
- Recent changes
- Random page
- Help

Powered By
MediaWiki

GNU FDL
FREE DOC
LICENSE

designed by
GUPOL

How To Utilize Your Year One Portable USB Hard Disk

To all Year 1 students, you will be issued with a mini toy - *USB portable hard disks* from Duke-NUS Education Office in both Year 1, Semester 1 & 2. All the Year 1 course materials will be included in the hard disk with its respective course subjects as shown below:

Year One Course Subject

Semester One	Semester Two
Molecules & Cells	Brain & Behavior
Normal Body	Body & Disease
Practice Course 1	Practice Course 2



Contents [hide]

- 1 Get Started
- 2 How To Rsync
- 3 How To Safely Remove The USB Hard Disk
- 4 How To Safe Keep Your USB Hard Disk
- 5 My Documents

Get Started [edit]

Weekly TeamLEAD Schedule

GMS Course Timetable Week View

Calendar Views: [Week View](#) | [Month View](#) | [Quarter View](#) | [Year View](#)

Show Events in Category:

For Date:



Go

Class year: [All](#) | [Year One](#) | [Year Two](#) | [Year Three](#) | [Year Four](#)

< 31st Aug 09 to 6th Sep 09 (Week 36) >

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
<ul style="list-style-type: none"> 10:00 AM - 12:00 PM RA # 5 LEAD Room - Level 2 - Duke-NUS new campus 2:00 PM - 5:30 PM TeamLEAD # 5: Genetics LEAD Room - Level 2 - Duke-NUS new campus 	<ul style="list-style-type: none"> 8:30 AM - 11:00 AM Histology Lab # 3: Connective Tissue and Blood LEAD Room - Level 2 - Duke-NUS new campus 12:00 PM - 1:00 PM Duke-NUS Research Seminar Amphitheatre - Level 2 - Duke-NUS new campus 	<ul style="list-style-type: none"> 8:00 AM - 12:00 PM Practice Course LEAD Room - Level 2 - Duke-NUS new campus 12:30 PM - 1:30 PM College Meetings (Venue: #03-15, #03-17, #03-18, #03-19) 2:00 PM - 4:30 PM IMT - Describing comparisons LEAD Room - Level 2 - Duke-NUS new campus 	<ul style="list-style-type: none"> 10:00 AM - 12:00 PM RA # 6 LEAD Room - Level 2 - Duke-NUS new campus 2:00 PM - 5:30 PM TeamLEAD # 6: Cell Cycle LEAD Room - Level 2 - Duke-NUS new campus 	<ul style="list-style-type: none"> 5:30 PM Chill-out session organised by the Student Council (Venue: Student Lounge) 		

Adapted from the SuperCali Event Calendar

Calendar displays events listed in the sub categories and parent categories of the selected category

Prework:

TeamLEAD # 2: Getting around the cell - Time and Space

Close Window

Category: **TeamLEAD**
Venue/Location: **LEAD Room - Level 2 - Duke-NUS new campus**
Faculty members: **David NG** () - Primary instructor
Marc FIVAZ () - Primary instructor
Date: **Thursday, August 20, 2009 - 1:30 PM - 5:00 PM**
Description: Learning Objectives

Protein folding

1. Proficiency to describe principles that determine the three-dimensional fold of a protein.
2. Critically evaluate different models of how proteins fold.
3. Compare and contrast the different molecular mechanisms for how misfolded proteins can cause certain diseases.

Translocation and quality control

1. Describe the biophysical and biochemical basis for protein misfolding.
2. Appreciate the different fates and cellular consequences of misfolded proteins.
3. Understand the cellular response to misfolded proteins and the mechanisms used by cells to cope with protein misfolding.

Event materials **TLEAD 02**

- Cytoskeleton

- [0808131300in100b9d02700009064194.mov](#)
- [0808131300in100b9d02700009064194.mp3](#)
- [16_1.mov](#)
- [16_1.mp3](#)
- [16_1.wmv](#)
- [EndowCBI200Cytosk2008.V1\(2\).ppt](#)
- [EndowCBI200Cytosk2008.V1.ppt](#)

- Cytoskeleton in health and disease

- [0808221000in100b9b02700009144194.mov](#)
- [0808221000in100b9b02700009144194.mp3](#)
- [vBennett_2008.ppt](#)

- Davis Ng Compulsory Readings

- [Clerc et al.pdf](#)
- [Quan et al.pdf](#)

Learning resources and readings

Mandatory

1. In preparation for the TeamLEAD session, please review the video lectures & power point slides under the following topics:

- Cytoskeleton in health and disease
- Cytoskeleton
- Motor proteins in non-muscle disease
- mRNA export and trafficking
- Protein synthesis and protein degradation
- Molecular mechanisms of protein folding and misfolding
- Protein translocation Protein quality control-ERAD
- Protein trafficking Protein sorting
- Exocytosis and endocytosis

2. Research Articles: These are the studies that the applications section will focus on. Please read these papers carefully in advance of class and bring along a copy of each.

- Clerc, S., Hirsch, C., Oggier, D.M., Deprez, P., Jakob, C., Sommer, T., and Aepli, M. (2009). Htm1 protein generates the N-glycan signal for glycoprotein degradation in the endoplasmic reticulum. *J Cell Biol* 184, 159-172.

- Quan, E.M., Kamiya, Y., Kamiya, D., Denic, V., Weibezahn, J., Kato, K., and Weissman, J.S. (2008). Defining the glycan destruction signal for endoplasmic reticulum-associated degradation. *Mol Cell* 32, 870-877.

USB disk access



TeamLEAD Module: Readiness

Individual Assessment



Individual assessment: Answers entered with an audience response unit



Individual assessment: Review responses

Green = correct, red = incorrect



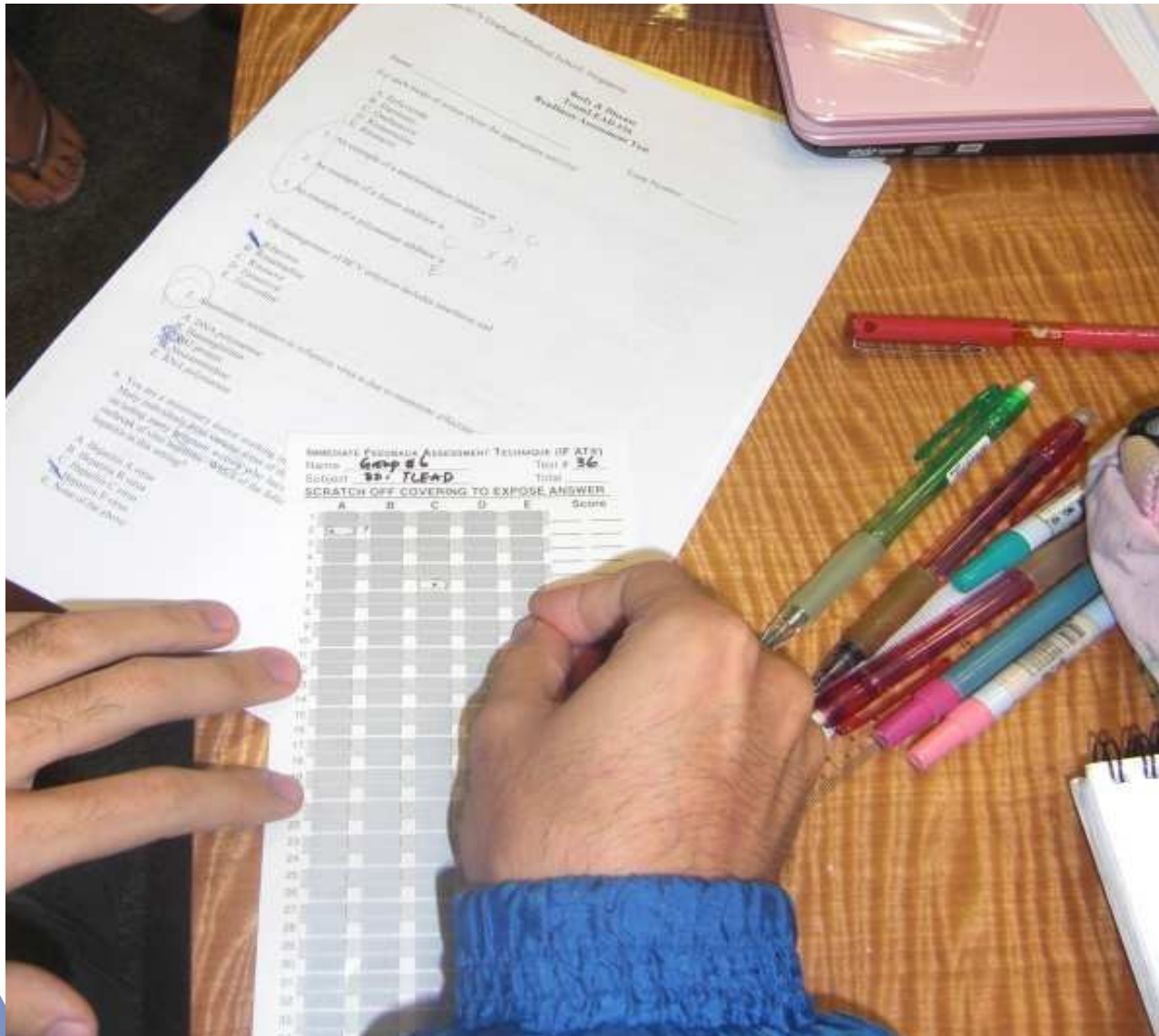
TeamLEAD Module: Readiness

Team assessment



Team readiness: Record answers

Scratch-off answer pad



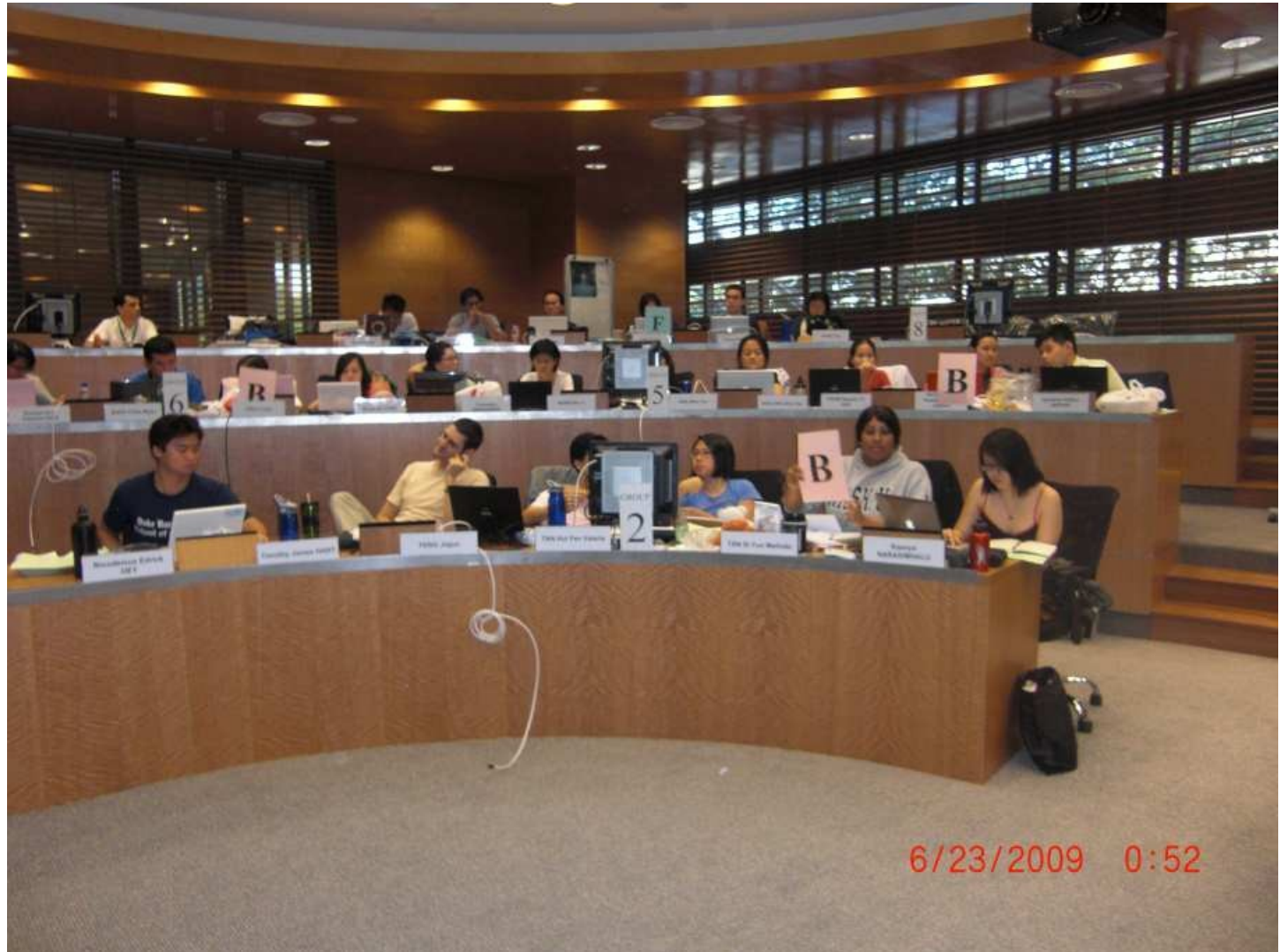
TeamLEAD Module: Application

Team problem solving



Application (1 – 2 hour problem)

Consensus answers to application questions



Body and Disease: Application learning with Doyle Graham



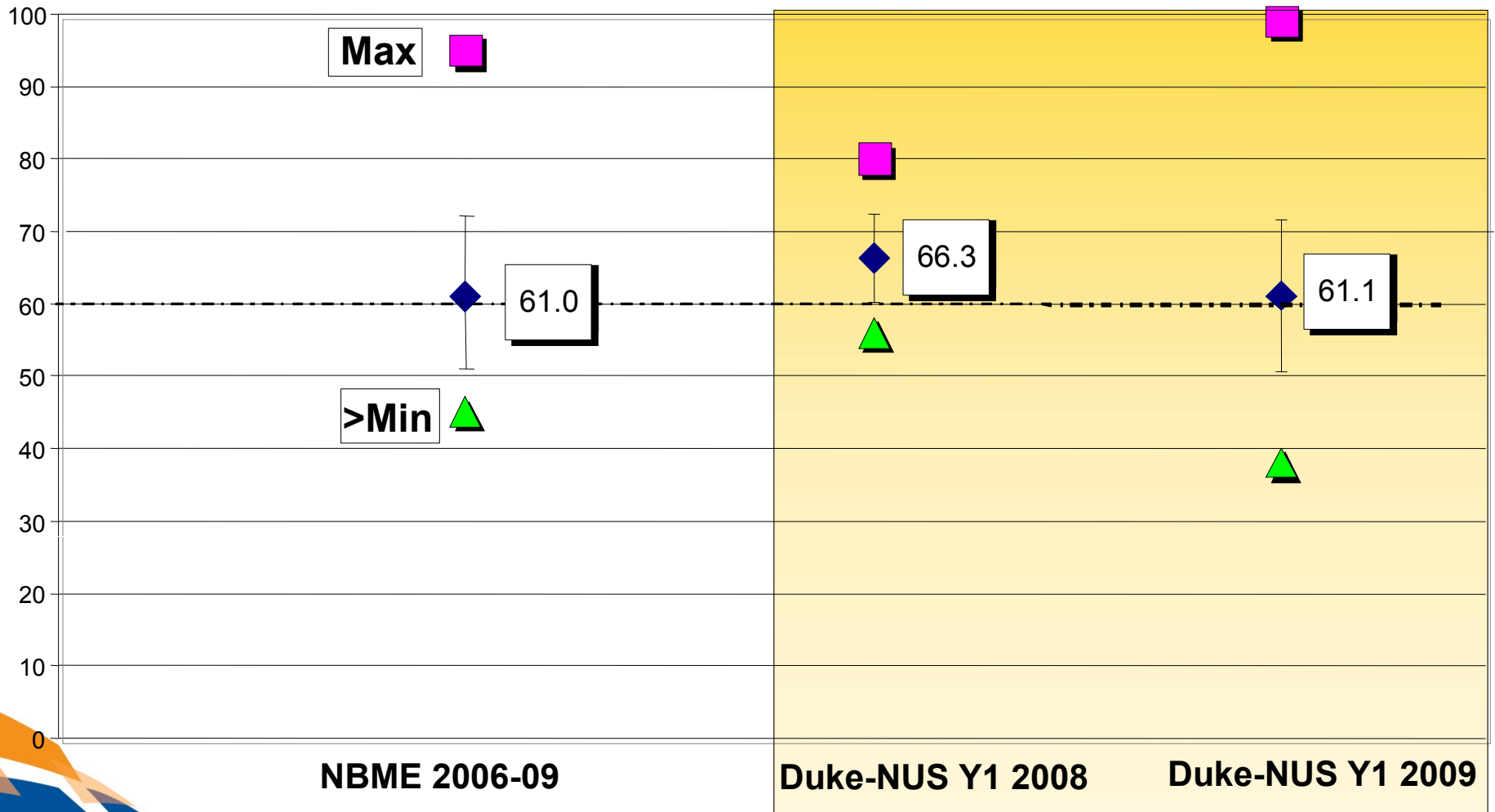
How are we doing?

Stead-inspired TeamLEAD vs the world?

Entrance Background Comparisons (Two Measures)

Rank	School	Biology	Physical Sciences	Verbal Reason	MCAT Total	GPA
1	Johns Hopkins	12	12	11	35	3.86
2	Washington U	13	13	11	37	3.89
3	Univ of Penn	12	12	11	35	3.82
4	Duke Univ	12	12	11	35	3.81
5	U of Michigan	12	12	11	35	3.81
6	Yale Univ	12	12	11	35	3.75
7	UC SF	12	11	11	34	3.80
8	Baylor College	12	12	11	35	3.80
9	UT SW - Dallas	12	12	11	35	3.85
10	Vanderbilt Univ	12	12	11	35	3.77
	<i>Duke-NUS</i>	<i>11</i>	<i>11</i>	<i>9</i>	<i>31</i>	<i>3.5</i>
95	Albany Med Col	10	10	10	30	3.52

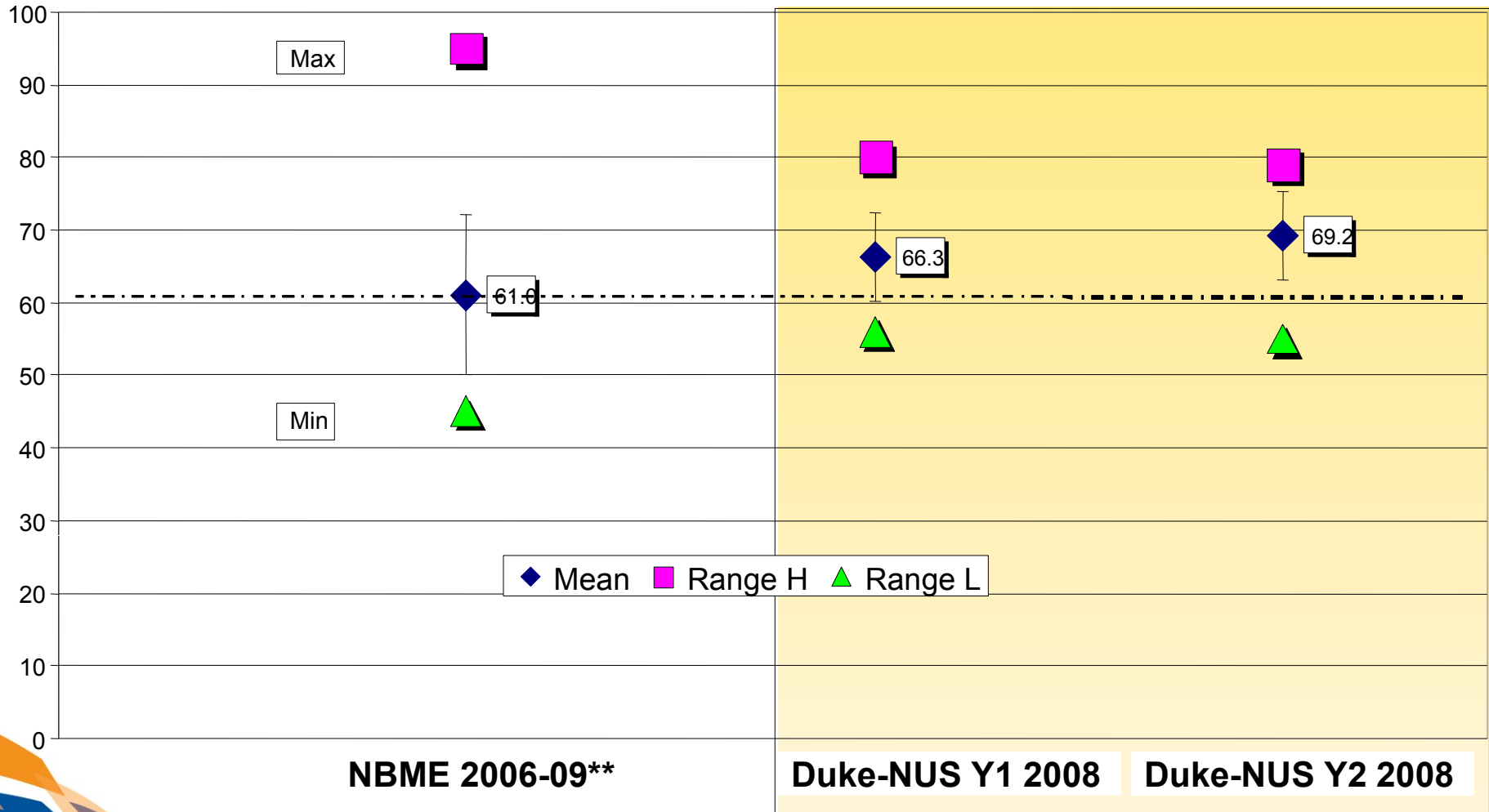
NBME Comprehensive Basic Science Exam (CBSE) NBME Normed (2006-2008) and Duke-NUS (2008 & 2009)



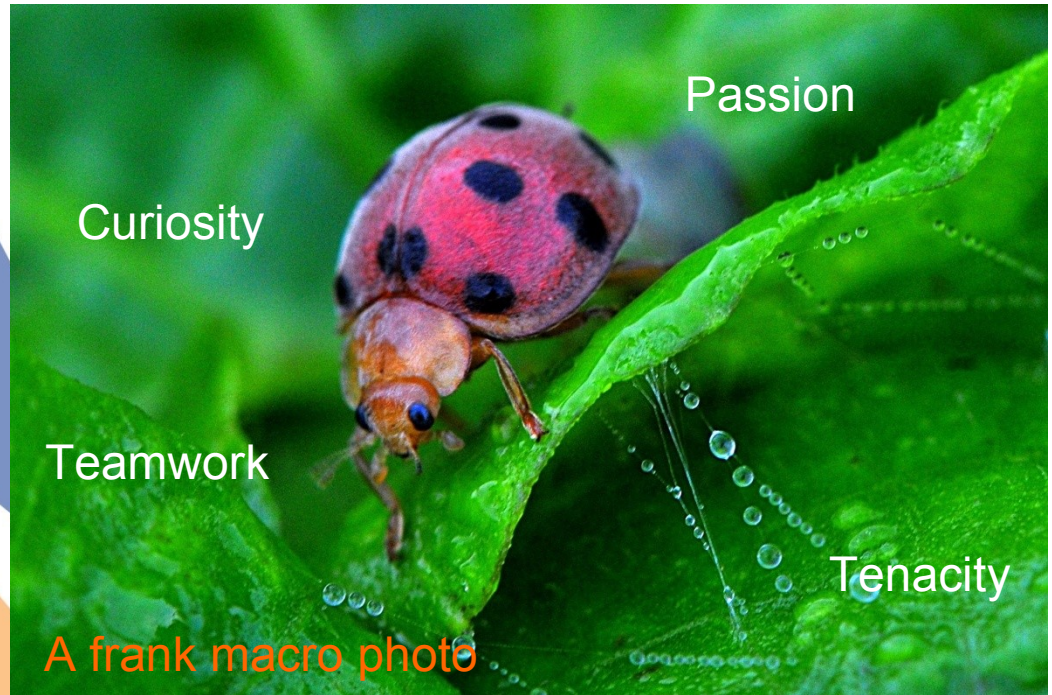
◆ Mean ■ Range H ▲ Range L

NBME Comprehensive Basic Science Exam (CBSE)

NBME Normed (2006-2008) and Duke-NUS (Class 2011)
Taken at End of First and Second Year



Thank you





Backup Slides

Academic Background

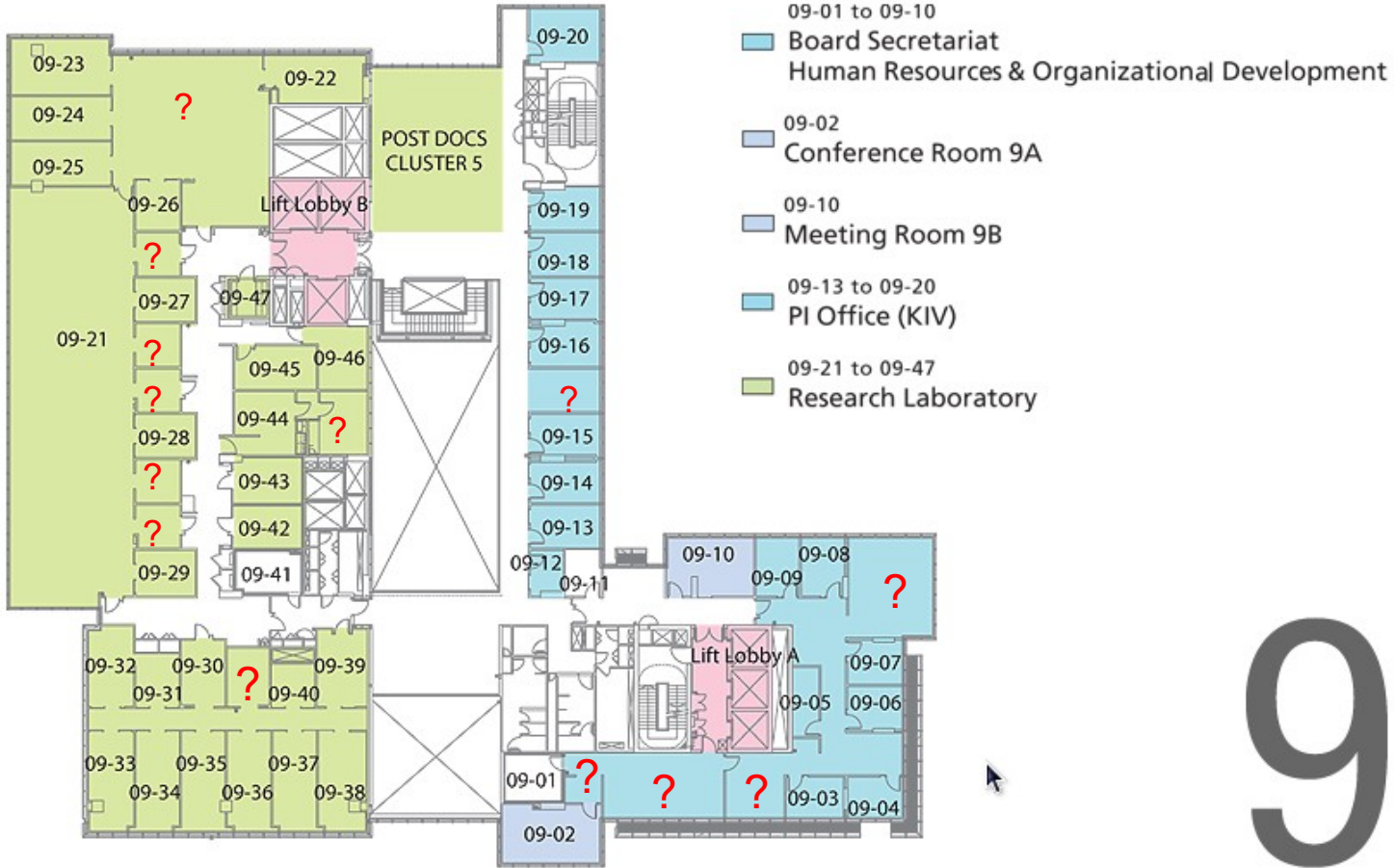
Class of 2011	Class of 2012	Class of 2013
Undergraduate Degrees	Undergraduate Degrees	Undergraduate Degrees
Biology/Life Sciences (14)	Biology/Life Sciences (29)	Biology/Life Sciences (37)
Engineering (5)	Engineering (11)	Engineering (11)
Pharmacy/Pharmacology (4)	Pharmacy/Pharmacology (3)	Chemistry (3)
Computer Science (2)	Anthropology (2)	Psychology (1)
Chemistry (1)	Chemistry (1)	Kinesiology (1)
Higher Degrees	Biopsychology & Cognitive Science (1)	Dentistry (1)
Masters Degree (4)	Nutrition (1)	Statistics (1)
PhD (1)	Higher Degrees	Natural Sciences (1)
	Masters Degree (7)	Higher Degrees
	PhD (2)	Masters Degree (8)
		PhD (1)

Peer Evaluation (Approximately 10% Team Grade)

- Rating of team members: 1, 2, 3 (only 2 3s permitted) 3%
- Self evaluation of feedback (quality and quantity) 3%
 - 0 Zero feedback or not constructive
 - 1 Some feedback but not constructive
 - 2 Constructive feedback to some but not all
 - 3 Constructive feedback to all team members
- Self reflection on feedback received (given to advisors) –
for submitting some reflection and on time. 4%

Greatest Challenge: Cross-cultural communication

Problem: How to locate a person / printer / network connection?

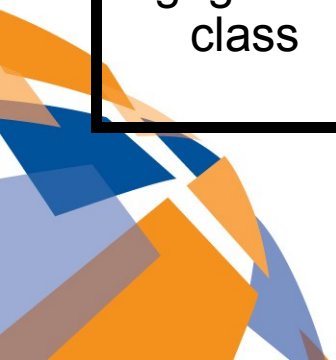


9

CLOSE X

PBL does not scale well

	TBL	PBL	Lecture
Center of Instruction	Student/Faculty mix (faculty direct what is learned in prework, students determine what is learned in class)	Student (students determine what questions need to be answered to solve clinical problem)	Teacher (faculty determine what is to be learned)
Size of learning groups	Teams of 6-7 students, but all teams in single room, (learning occurs from other teams)	Groups of 6-7 each meeting by themselves (learning mostly within own team, limited learning from other Teams + mentor)	Entire class in a room
Engagement in class	Active	Active	Passive



	TBL	PBL	Lecture
Scalability in larger class size	Moderate (can be done in larger classes)	Difficult to scale up, requires more faculty as class size increases	Easy to increase class size without additional faculty
Learning skills	Student/Faculty mix (faculty direct what is learned in prework, students determine what is learned in class)	Student (students determine what ?s need to be answered to solve clinical problem)	Teacher (faculty determine what is to be learned)
Faculty	Facilitator and Expert	Facilitator and Expert	Expert
Student preparation before class	Well prepared	Limited preparation	Limited preparation
Outside homework	Preparation only, no homework	Extensive group activities required	No homework routinely

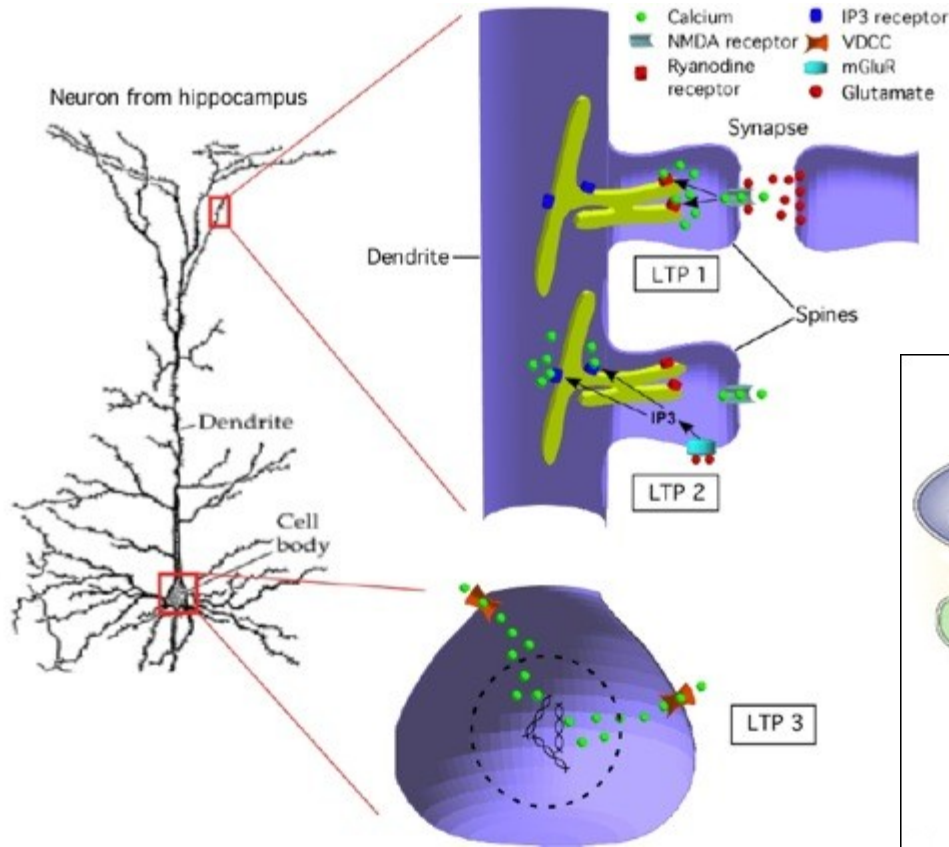
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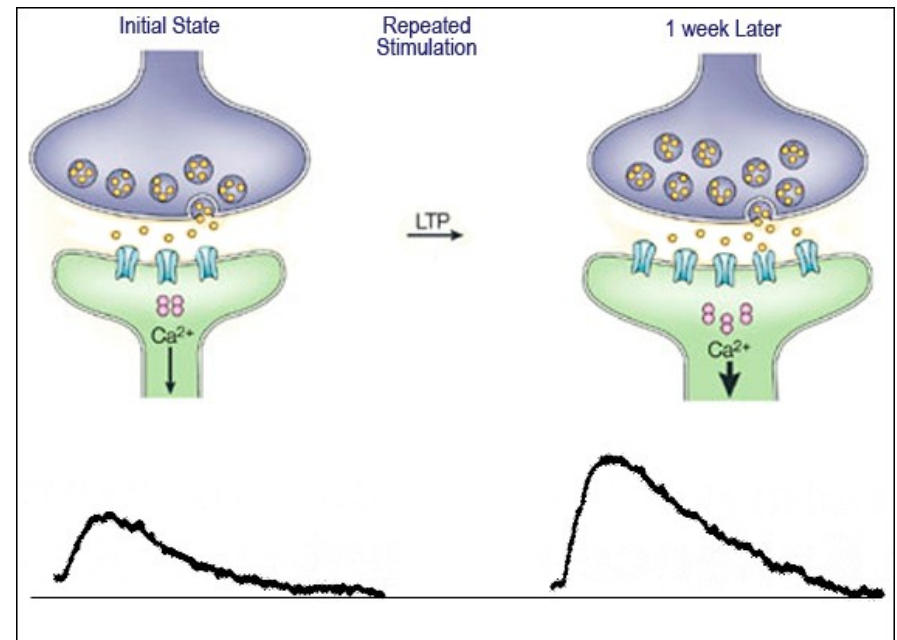
Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
	Molecules & Cells (6.5 wks)	Normal Body (11.5 wks)				Brain & Behav (4 wks + Chinese NY)		Body & Disease (20 wks)		Body & Disease (20 wks)		
	Practice course 1			and	Investigative		Methods and		Tools			

- 4 Integrated Courses
- 2 Longitudinal Courses
- Instructional strategy uniquely Duke-NUS

Neurophysiology: Learning Models



Repetition-dependent long term potentiation



From http://web.bvu.edu/faculty/ferguson/Course_Material/Gen_Psy_New/Modules_18_19_Memory/Default.htm

Transforming Medicine, Improving Lives

Focusing Curiosity:

Water: Liquid and Vapor Phases (physical process)

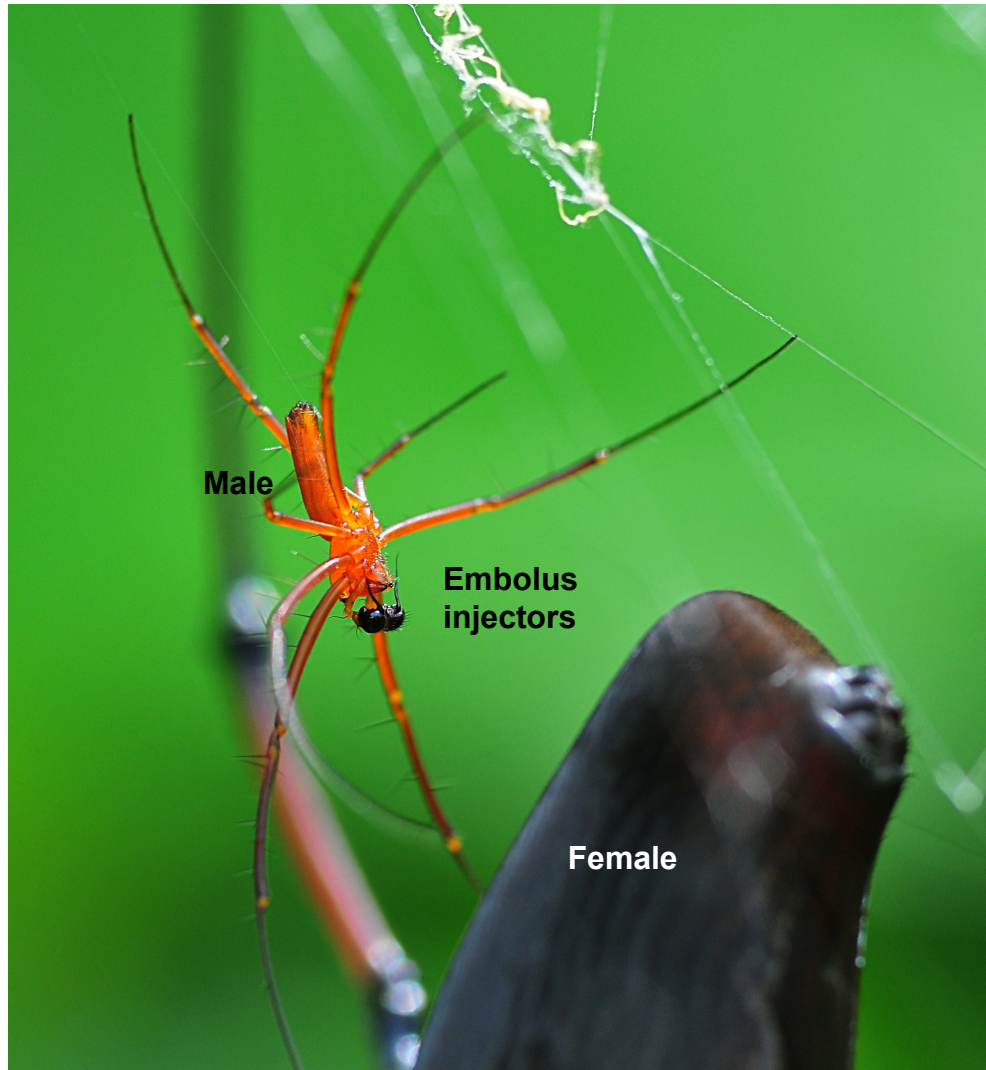


Focusing Curiosity: Spider Mating (behavior)



Miagrammopes

Repeat visits to the same place: an opportunity to observe behavior over time



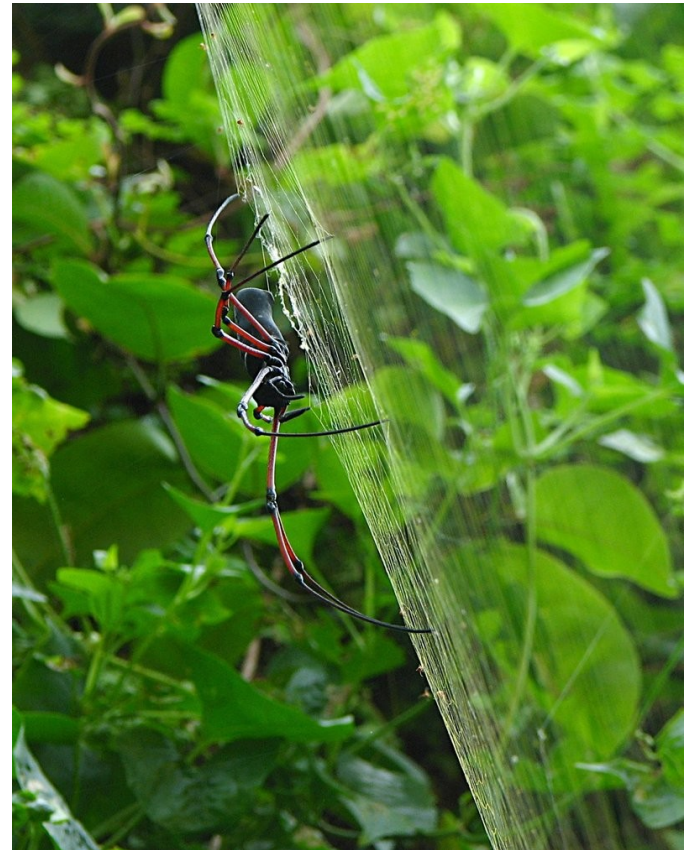
Nephila philipes:
Mating tools

Argyrodes flavescens: a kleptoparasite



Sky Reflections

Size scale





Water vapor condensation: morning dew

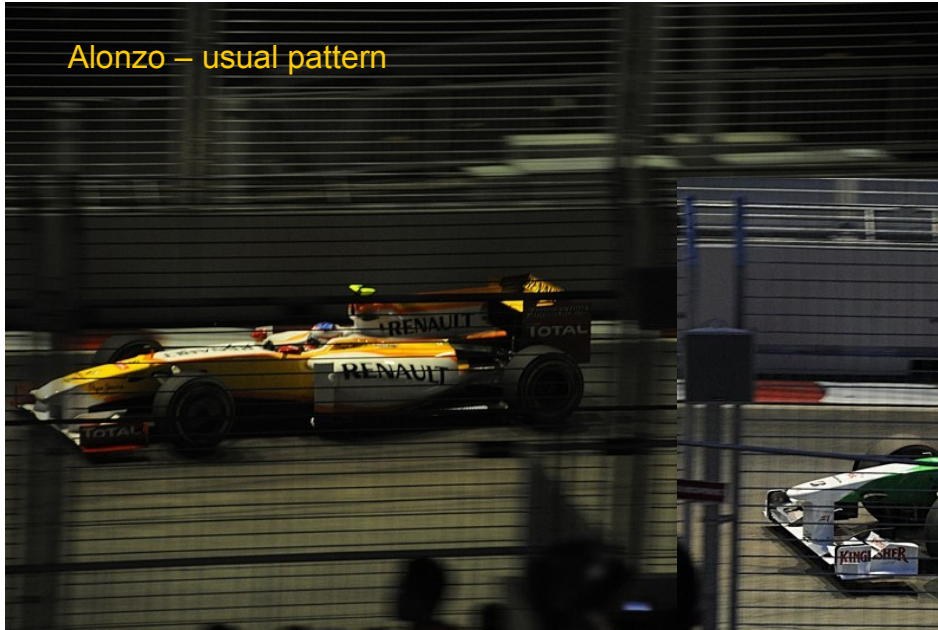
Transforming Medicine, Improving Lives

Some thoughts about learning

- Repetition is the first law of learning
- We can't learn everything: we forget what we infrequently use
- Curiosity fuels my learning and passion (because its fun)
- When I can focus my curiosity, I'm more likely to find something interesting
- Repeated observations accelerates recognizing patterns
- Detecting deviations from expected patterns = curiosity
- Learning without subsequent use or as fuel for thinking is probably pointless

2: Refine focus. Repeated observations enables temporal pattern recognition

Alonso – usual pattern

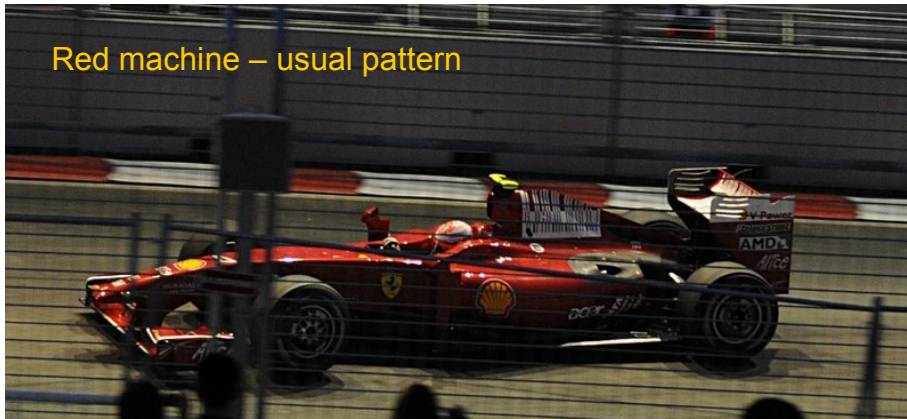


Lap after lap – braking as they approach turn 18 (Bay Bleachers)

Alonso – next lap, usual pattern



3: Look for temporal patterns



Red machine – usual pattern



Blue machine – usual pattern



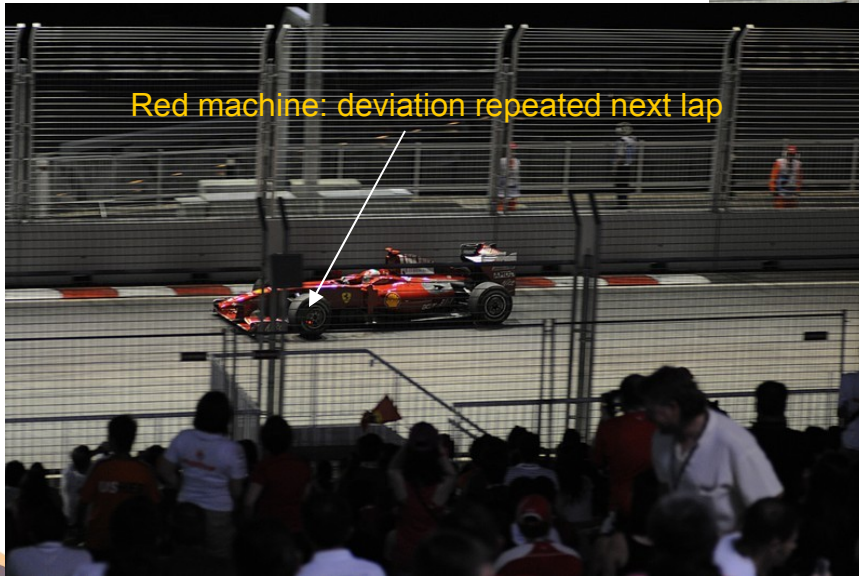
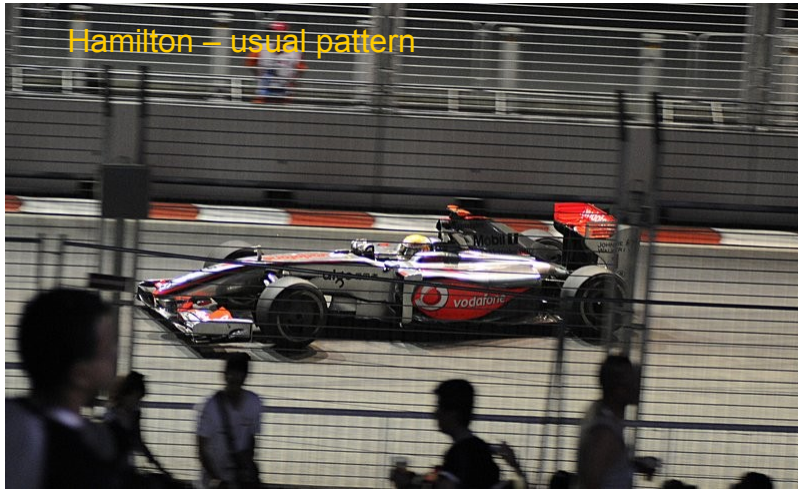
Red machine – deviation from expected pattern

Oops – pattern broken

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Brake fire limited to red machine



Oops – brake fire infected Hamilton
4: Learning opportunity: What is the overheating mechanism?

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