

How to be world class? A personal viewpoint

Professor Arun S. Mujumdar

NUS, SINGAPORE

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Outline

- *What is world class? Definition?*
- *Why world class?*
- *Ways to world class status?*
- *Is it destination or direction?*
- *Some Do's and Don'ts for budding researchers and potential academics*
- *Closing remarks*

What is world class (WC?)

- What is it? Don't really know!
- Destination or direction to a destination decided by mission?
- How do we know if we have "arrived" at the WC station?
- Most misused words in Vision and mission statements of academic institutions worldwide.

A suggestion..

- How about trying to become simply Excellent ?
- Benchmark according to local needs, resources and opportunities
- Pie-in-the-sky goals unlikely to succeed
- Try to excel in whatever it is that is relevant in space and time for a given institution

Why W C does not work?

- Suffers from *changing goalposts* syndrome!
- Bar setting decided elsewhere with no control and a reliable calibrated yardstick to measure excellence
- Highly subjective judgment required
- Highly nonlinear, coupled problem with non-unique solution- hence ill-posed!

Excellence for universities..

- Hard to define- often we know it when we see it!
- Depends on time and location: yesterday's excellence maybe tomorrow's mediocrity!
- Darwinian evolutionary selection process at work in institutions as well since limited resources and global competition decides who survives

How to be excellent?

- Short answer: with great difficulty!
- Institutions must excel in teaching, research and service- a tall order!
- Subjected to global scrutiny at every stage- just check out the elaborate tenure/promotions processes at major universities!
- Diverse criteria needed to reduce "bias" in judgment

Excellence in knowledge dissemination

- Depends on quality and numbers of both students and teaching faculty
- Reputation often based on research which attracts students (UG and PG) and visibility
- Strongly coupled relationship between research, students, faculty and numbers!
- Excellence in providing education means excellent teaching and learning environment- just one is not enough!

Excellence In teaching

- Resistance to teaching (thru good teaching methodology and pedagogy) AND resistance to learning (thru students working diligently, intelligently and creatively) must be minimized!
- Focus only on teaching sends wrong signals and stresses simplifying and reducing challenge in learning process.
- Rote learning, memorization without understanding concepts and yet doing well in exams is recipe for failure eventually.

Education--contd

- Focus on fundamentals, concepts etc is more important than volume of content and ability to learn mechanics rather than principles of problem-solving
- Solution of standardized problems thru pattern recognition can destroy creative thinking skills
- Use of classical texts rather than brief Notes designed for standard exams, can enhance self-study skills and improve real understanding of subject matter at UG level

Excellence in Research

- Like education, also dependent on quality of students and staff plus availability of competitive funding
- Easy availability of funds can destroy need to excel
- Reserved funding for emerging areas can also breed mediocrity since it is often noncompetitive and in plenty!
- New trend: mega funding for things nano and nano funds for things mega!
- Extra funds should be consistent with new ideas generated or deserving of R&D!

Characteristics of Research

- Process is usually nonlinear-however, often research proceeds in a serial fashion i.e. one advance prompts the next one etc.
- Progress along parallel channels is possible but rare-often it results in duplication of effort and hence less cost-effective
- Hence major infusion of funds in new areas does not lead to proportional advances in new fields- no linear relation exists between advances and funds consumed! Like in a horse race ,only a few win the race and rest are "also-ran's".
- Critical mass of researchers and funding is required to make an impact in many new fields.

Chemical Engineer's view of processes needed to achieve excellence in research

- Researchers must be good at applying various unit operations of ChE e.g.
 - Absorption/ Adsorption (of previous and current ideas)
 - Extraction (of key ideas etc)
 - Distillation (best ideas/concepts from the brew!)

More ChE unit operations...

- Blending/Mixing (multi-disciplinary..)
- Evaporation (concentrate on key ideas and concepts)
- Agglomeration (inter-disciplinary idea generation)
- Grinding(look at small scales!)
- Etc etc

Some suggestions for budding researchers..

- Be flexible, open to new ideas
- Refrain from influence of media or flavor-of-the-month clubs!
- Balance depth with breadth of knowledge
- Be well-informed, up-to-date, creative, critical, imaginative, innovative etc
- Work hard, ethically and sincerely!

More suggestions..

- Risk is key to original, innovative research- do not be risk-averse
- Take ownership of research you do- be CEO and COO of your project! Make your supervisor CFO!
- Filter, absorb, extract, distill, agglomerate available data; separate valuable product from waste, and come up with original contribution to your field.

Some more suggestions...

- Remember to lay a firm foundation first- then build a super-structure-or else it will come crumbling down sooner than you think!
- All fields have a finite life- some have longer life cycles than others. Hi Tech typically works on short cycles- fast /big returns but you must be must be nimble to keep changing colors with environment like a chameleon! Are you ready?

Closing Remarks

- Do not confuse innovation with renovation! Decorative shells have a bad habit of cracking in time !
- Creative marketing can have a short term effect (buzz words, new titles and name changes etc); without substance, these invariably backfire!
- Focus on fundamentals- nanotech R&D can go nowhere without firm grounding in physics

Closing remarks-contd

- Think globally, act locally!
- Avoid XEROX syndrome- do not copy or become mirror image of another WC institution elsewhere.
- Collaborate effectively
- Build networks globally
- Build inter-disciplinary bridges- don't try to become scientist and engineer simultaneously for you may become neither!

- The END....Thanx for your attention!
- *This presentation reflects the personal viewpoints of Prof. Arun Mujumdar and not of anyone or any institution.*