How to be world class?
A personal viewpoint

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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.

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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.