

tives related to **2** by varying the lanthanide metal and the substituents on the cyclopentadienyl ring would enrich the organometallic chemistry of lanthanides as well as the chemistry of carbocations.

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COMMENTARY

The Exponential Law of Academic Decay

G. Prathap and U. N. Sinha

Preamble

The National Aerospace Laboratories run a very vibrant programme using students on its various projects and missions. This student strength has grown rapidly and currently as many as 650 students (BE, M Sc, MCA, ME, Ph D) work on various assignments of relevance to NAL and at the same time meet the requirements of excellence demanded for submission of dissertations to their respective university departments. Many on completion of their student training programmes join in various temporary capacities in NAL, e.g. as Graduate Trainees, Post-graduate Trainees, JRFs, SRFs, Fellows, etc.

Over the last few years, we (GP and UNS) have been able to closely interact with a sample size of about 150 students on some major developmental projects in NAL which for various logistical reasons were dependent not insignificantly on 'student-power'. This has allowed us also to observe them closely in a sociologically significant manner, both as mentors in providing them informal on-the-job train-

ing and on dissertation preparation and also as task-givers in assigning tasks and monitoring their completion and delivery in keeping with the project and mission requirements. Thus, a continuous chain of work definition, performance management, training and development, and appraisal and reward is involved in our interaction with the students. Also, in view of the difficulties in absorbing these young talent in permanent positions in NAL due to current hiring restrictions, it is necessary for us to humanely manage their 'organizational exit' from NAL after they have completed their temporary assignments.

Formulation of 'The law of exponential decay'

A rapid turnover of students is involved and many have been observed carefully. Often we (GP and UNS) have compared notes on our experiences using these students and from time to time, we have appeared jointly or separately before com-

mittees seeking views on how to formulate postgraduate education and research programmes for the future. One underlying theme that we have discerned and conceptualized and that we feel must be taken care of by any planner/policy maker/administrator who wants to design a framework for PG education and research or even a Human Resources Management Policy is what we call 'The exponential law of academic decay'. Note that our formulation is particularly inspired by Andre Weil's famous law—'A first rate man will hire a first rate man; a second rate man will hire a fourth rate man; etc.', although the contexts are slightly different.

Figure 1 captures the spirit of the law. We have assumed that the y-axis shows some kind of ability (IQ, achievement indicator, etc.) rating while the x-axis shows the career path. The exponentially decaying solid line shows how and when the transition is made from academic career to professional career. What we find is that undergraduate students, especially if they are from elitist institutions

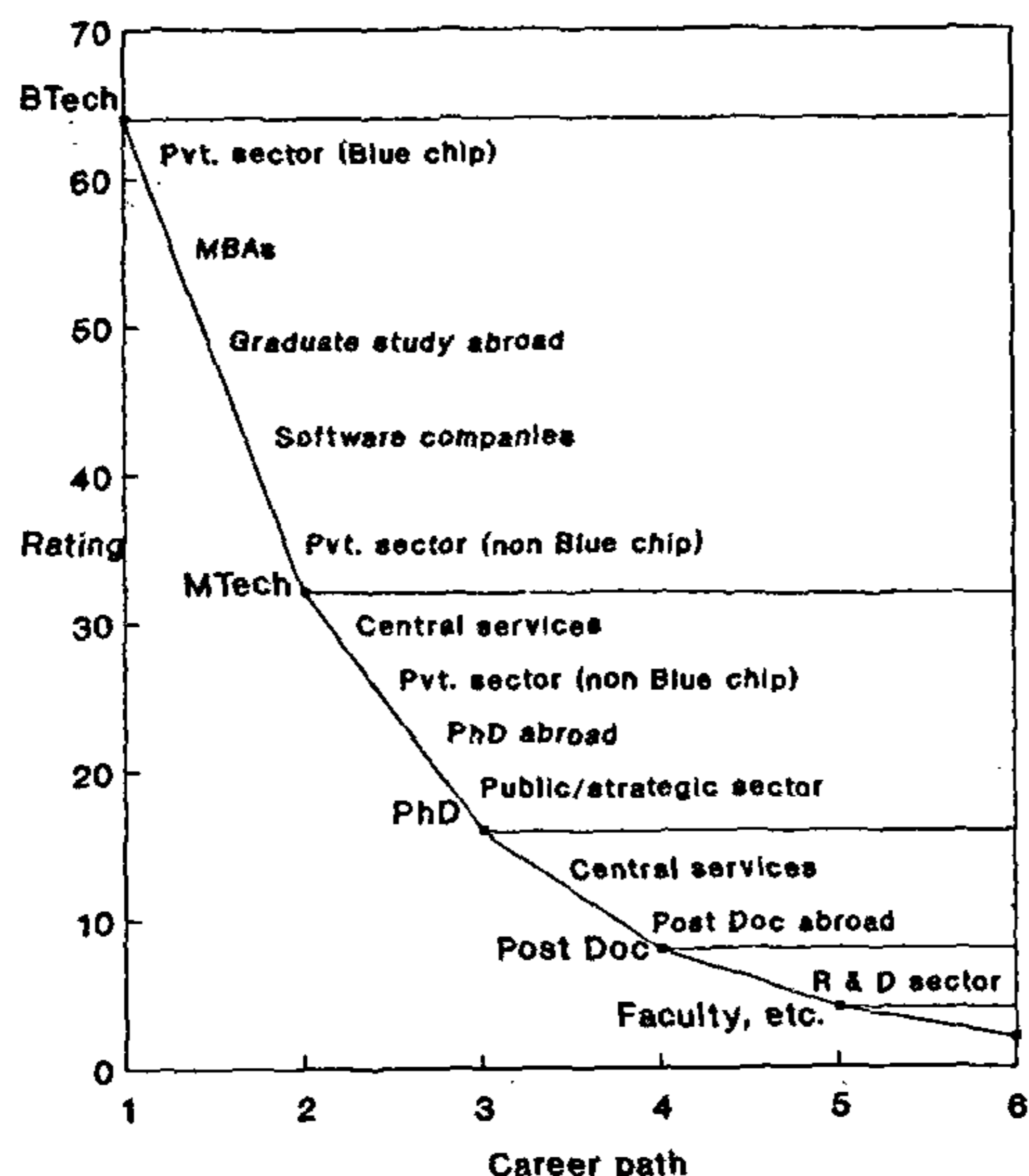


Figure 1. Exponential law of academic decay.

like the IITs, BHU IT, BITS, etc. are first rate. Their natural choices of employment are: direct entry to blue-chip companies, entry into MBA programmes, going abroad for graduate programmes, joining software companies, and taking up employment with other ET 500 type private companies, approximately in this order of preference.

After this cream has been skimmed off, the remaining, which are arguably second rate by now, are the ones who join the various ME/M Tech programmes being run in the country. Even here, there is a large degree of loss and wastage (latest available figures compiled by AICTE show that of a sanctioned strength of around 17,000 places, only about half of the seats are filled, and of these, only about 5000 graduate). It is not difficult to assign causes. There is enough anecdotal evidence to indicate that a large number of M Tech students are on 'holding pattern' preparing for various Central Services Exams. Some leave as soon as job opportunities appear and some even discontinue mid-way if they can join

graduate programmes abroad. Those who do complete the degree join private, public, and strategic sector (atomic energy, defence, space, etc.) organizations. Thus, we are left with what we can cruelly condemn as fourth-rate talent joining the doctoral programmes. Extrapolation of these exponential decay rules leaves us with the very alarming scenario where post-docs are 8th rate and those waiting to take up faculty positions are decidedly worse.

Willie Sutton's Law, or, 'That's where the money is'

It is also not difficult to understand the underlying force-field that produces the pattern shown in Figure 1. We have assumed that the y-axis shows some kind of ability rating. What is unseen is that what decides how ability is tapped at varying levels using a very efficient filtering mechanism are open market forces and the pricing it implies. We call it Willie Sutton's law. (We recall reading

a statement of this in a letter to *Nature* where the author quoted this to explain why very few medical doctors leave clinical practice for research.)

Willie Sutton, we are told, was America's greatest bank robber. When he was finally caught, he was asked the question, 'Why did you rob banks?' His answer, which made the questioner look very silly was, 'That's where the money is'. We see Willie Sutton's Law operating on our exponential law of academic decay. The highest compensation packages are in the private sector blue-chip companies, in the financial and banking sectors (hence the rush to do MBAs), in the software companies, etc. No wonder the brightest and best are on tap here. The best therefore leave the academic sector young; the lowest linger the longest within the academic sector and settle for the poorest compensation packages. As long as the compensation patterns remain what they are, there is no way this iron law of decay can be bypassed.

Recommendations

We feel that we must now pay close heed to the inexorable working of these underlying principles. We must appreciate their implications when planning for postgraduate programmes for engineering education and research and also when we design pay structures for public, strategic and academic sector employees. Otherwise, in this age of marketization and privatization, we will be a nation of shopkeepers at best, and at worst, an exporter of high-tech coolies (witness the body-shopping that characterizes our software industry). We will be poor in philosophy and worse in science, and virtually helpless in re-engineering our own revival using technological inventions and innovations as the principal engines of economic growth and comparative and competitive advantage.

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