Challenges in Knowledge Management Under the New IPR Regime

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SCIENTIFIC DISCOVERIES, TECHNOLOGICAL INVENTIONS

What is the celebrated Raman Effect ? To quote in the very simple description of Prof Arul Das from his very recent text book " Molecular Structure and Spectroscopy ", Prentice Hall, 2001,

Photons can interact with molecules of matter in a number of ways. When they strike a solid or collection of molecules, most of them are scattered elastically (Rayleigh scattering). But a few (one in a million) undergo inelastic scattering. These inelastically scattered photons have frequencies lower and higher than the incident frequency. This phenomenon, predicted in 1923 by Smekel and observed by C.V.Raman in 1928 is referred to as Raman scattering.The lines on the low and high frequency sides of the Rayleigh line are called Stokes and anti-Stokes lines respectively.The scattered photons have frequency shifts (10 - 4000 per cm) characteristic of the vibrational or rotational energies of the molecule.These weak lines of modified frequencies are generally referred to as the Raman Spectrum and the frequency shift from the exciting line as Raman shift".

Advantages of Raman over IR spectroscopy are the following :

The energy of interest is generally 10-4000cm-1, requiring light of l 100mm to 2.5mm which presents experimental problems with IR spectroscopy. This is easily achieved with Raman.

1. It is harder to focus with IR due to the large and varying wavelengths used in microIR. It is very easy to focus using microRaman.

2. Water is a strong absorber of IR so this rules out IR spectra of water or species dissolved in it. Water presents no experimental problems in Raman experiments.

3. Raman spectral studies are unaffected by powder particle sizes or shape.

4. In Raman studies the dimensions of the particles are large compared to the wavelength of the beam, ~0.5mm, so spectra are essentially discrete lines. Obviously the discovery of Raman Effect was of very great significance. Acclaimed internationally, he was knighted in 1929, became Fellow of Royal Society in 1930 and to no surprise the Nobel Prize in 1930 " For his work on the scattering of light and for the discovery of the effect known after him". Undoubtedly it also became a moment of great glory for our country.

To quote again Prof Arul Das,

"The first Raman spectrum of an organic compound was observed using sun as the source, a telescope as the receiver and human eye as the detector.As the scattering efficiency is proportional to the fourth power of frequency, one prefers to work with a high frequency source. However to reduce fluorescence low frequency is preferred. In the pre-laser days, the commonly used sources were the

435.8 nm blue and the 253.6 nm uv lines of the mercury vapour … with very great disadvantages…. With the discovery (only) of lasers the situation changed considerably".

And this heralded the acclaimed Laser Raman Spectra without which much of present day research in the field would not have been possible at all. In other words, Raman Effect has become immortal in all sense of the word in scientific research. When we bow our heads today in his honour, we honour all those scientists and technologists who made Raman Effect an every day feasibility. It is in this connection that I invite your attention the fact that whereas Raman had discovered his effect and published extensively on the same in very renowned journals such as Nature, Philosophical Transactions, etc, he had also invented the first Raman Spectrometer, yet he did not resort to patent the latter concurrently. A quick search of the world literature indicates that there are over 90 patents for " Raman Spectrometer". One of the latest ones is:

US Patent No. 6,275,285 on " Laser Verification and Authentication Raman Spectrometer (LVARS) detecting the Stokes Anti-Stokes Emission".

Assigned to Wizard of Ink & Co.(Tuscon, AZ), the patent describes the invention of an LVARS " capable of performing analysis and verification and authentication of the optical and electromagnetic properties of organic and inorganic molecules, both natural as well as manufactured compounds".

In essence, invention of new Raman spectrometers for new purposes has continued to be a discovery-cum invention oriented R&D area of great interest even after its original discovery seven decades ago! It is an interesting thought indeed that if Raman had also patented his first spectrometer (this was not unusual, as was done for the nuclear reactor by the Nobel laureates Fermi and Szilard , the transistor by Shockley and his other two Nobel laureates colleagues , the one for new explosives by Alfred Nobel himself , and so on) and his institute either by itself or jointly with relevant electronics laboratories had also steadily developed newer Raman instruments as part of extending its studies to new areas of research, the Raman Research Institute at Bangalore would have had the benefit of additional financial resources as was the case with the Max Plank Institute at Mulheim with her Zeigler-Natta catalyst ! It is important to note that whereas there are over 500 Nobel Laureates in science and technology, the US Hall of Fame has honoured over 150 "Patent Laureates" who through their inventions of new products and processes have transferred the benefits of modern science and technology for the welfare of mankind. These names include Luis Pasteur, Carl Djerassi, Alexander Graham Bell, W.H.Carothers, Thoamas Alva Edison, Henry Ford, Charles Goodyear, and so on.

4.This brings us to the definitions of 'discovery' and 'invention'. As per definitions of the celebrated Random House dictionary, discovery means 'get knowledge of' and invention means ' to create as a product of one's own ingenuity or experimentation'.

Hence the reason that the discovery of Raman Effect forms a publishable matter whereas the invention of the Raman Spectrometer qualifies for and a product patent. Undoubtedly if science as an invaluable product of human labour has to play its un-surpassing role in human progress, scientific discoveries and inventions must go hand in hand in total complimentary fashion.

5. It is interesting that espousing a similar strategy the World Conference on Science held in Budapest held on July 2, 1999 under the joint auspices UNESCO and International Council for Science (ISCU) gave a Declaration on Science and the Use of Scientific Knowledge. The main points are the following.

a. Seeks active collaboration from all the fields of scientific endeavor.
b. Science for knowledge; knowledge for progress.
c. Science for peace.
d. Science for development.
e. National strategies and international co-operation needed to achieve the above needs.

Obviously it is understood that the Indian S&T programs also continues to follow essentially the rules of international S&T programs tailor-made to meet the specific political-economic-development needs - - systematic R&D programmes resulting in discovering new theories and inventing new products and processes of practical use and conversion of the priority products and processes into commercial technologies for national development. Hence the reason that patents and patenting practices also in turn form a very crucial element of such an S&T strategy.

6.Being a product of the celebrated Industrial Revolution and of modern science and technology, the first law on patents and patenting practices was incidentally enacted in her areas of control in India by the then East India Company in 1856.This was successively modified along the UK practices and this process was continued after 1947 by the newly independent nation in terms of the comprehensive Indian Patents Act, 1970. After entry to the WTO, the government is now amending the 1970 Act to become TRIPS-compliant; soon India will then enter into a New IPR Regime. What are the implications of these amendments for Indian S&T, these form the rest of the presentation.

INTELLECTUAL PROPERTY RIGHTS.

Introduction.

1. Patents for inventions, designs for industrial designs and trademarks for marketing products are collectively known as Industrial Property. Industrial Property plus Copy Right in Literary, Artistic and similar Works are commonly referred to as Intellectual Property Rights. The very first trademark registered in the United Kingdom in 1876 consisted of a red equilateral triangle used in alcoholic beverages, so also a system of registration of industrial designs since 1839. The provision of Copy Rights has again been in existence as an implied right since printing became a normal practice, the same becoming of course more explicit with the Paris Convention 1883 and the subsequent Berne Convention and the Universal Copy Rights Treaty under World Intellectual Property Organization, WIPO. Among all these rights, patents naturally occupy the premier position since it alone is related to new inventions through the systematic practice of science and technology, whereas others form only additional accessories for systematic spread of public knowledge (copy rights) and saleable products (industrial designs and trade marks). All the forms of IPRs are regulated by appropriate national laws, generally akin to providing legal protection of other forms of private property rights but fine tuned to meet their specific requirements, as discussed later.

Rangaswamy Srinivasan , the First Indian in US National Hall of Fame.

The vision of some extraordinary scientists, and a Thanksgiving turkey inspiration, has improved eyesight for nearly five million people worldwide, including over 2.5 million in the United States.

It has been announced that the inventors of photorefractive surgery, better known as LASIK, will be inducted into the National Inventors Hall of Fame this September. Drs. Rangaswamy Srinivasan, James Wynne and Samuel Blum are being honored for pioneering the development of laser surgery.

A surgical procedure intended to reduce a person's dependency on glasses or contact lenses; LASIK (Laser-Assisted In Situ Keratomileusis) permanently changes the shape of the cornea, the clear covering of the front of the eye, using an ultraviolet excimer laser. The team's discovery of the use of this laser for surgical purposes came out of a research program in fundamental science, in 1981, while at the IBM T.J. Watson Research Center in Yorktown Heights, New York. The patent was granted to IBM Corporation on November 15, 1988.

A recent American view on IPR

"In the American tradition,intellectual property law is largely motivated by utilitarian concerns. It is not designed to give property rights solely as a reward for hard work or to provide creators with a dependable annuity for their children, though it may in fact produce those results in some cases.It is about setting up conditions under which creators can and will produce new works..Setting the proper level of intellectual property protection requires a complex balancing act...If the level of protection is low,negative effects follow.Prospective authors turn to other careers.Drug companies drcrease investment in R&D..If IP rights are set too high, future creators will be deprived of the raw materials they use to create new works.For example, could Bill Gates have created MS-DOS if BASIC and CP/M had been proprietary systems protected by an expansive IP regime ? It is just as dangerous to produce a system with too much IP protection as one with too little".

ANY PRODUCT OF HUMAN LABOUR IS TWIN EDGED AND IPR IS NO EXCEPTION, CAN USED WITH BENEFIT, MISUSED AND ALSO ABUSED

KEYS TO HEAVEN OPENS THE DOORS ALSO TO HELL

A BUDDHIST SCRIPTURE QUOTED BY PROF RICHARD FEYMAN IN HIS VALUES OF SCIENCE

IPR CONFLICTS - EARLY EXAMPLES.

QUOTING FROM JUSTICE RAJAGOPAL AYYANGAR'S REPORT

" On suppression and Non-working of Patents" with special reference to the dye and chemical industry, Floyd Vaughan said: " It is a contravention of our patent law and an injustice to the American manufacturer to allow a foreigner to take out a patent in this country merely for the purpose of reserving United States as a market for his patented product which is manufactured abroad exclusively. It means the exclusion of all the would-be inventors and competitors from the industry covered by the patent and at the same time the building-up of the industry in other countries, all to the detriment of the United States" (American. Economic Review, Dec 1919).

In other words, adds Ayyangar, " these patents are therefore taken not in the interests of the economy of the country granting the patent or with a view to manufacture there but with the main objective of protecting an export market from competition from rival manufacturers particularly those in other parts of the world".

" FREE RIDING " - INDIA NOT ALONE ?

Just like the Indian companies in the drugs sector, the so-called " free riding" (a description used by American industry and IPR experts) strategy in IPRs have been used by many countries in strengthening their S&T – industrial base, the prominent examples being Korea, Taiwan, Singapore, Brazil, Argentina, etc. While initially the MNCs utilized the situation to their advantage through their advanced technologies and the locally available cheap labour , the NICs (Japan also included in this category) with their highly educated and hardworking labour force and supported by an appropriate policy perspective, as indicated earlier, learned slowly and steadily how to manufacture the items themselves and to export them back to the OECD countries at lesser costs , specifically in semiconductor and related items (in terms of IPR " free riding"). The Korean attitude was summarized by its Ambassador to US Kyun Won Kim in 1987 as follows:

"Koreans have not viewed intellectual discoveries or inventions as the private property of their discoverer or inventors. New ideas or technologies were 'public goods' for everyone to share freely" (quoted from "The Patent Wars " , Fred Warshofsky,1994). "

NEED FOR PATENTING

R&D results are patented only if they are found to be f practical use. Obviously the patenting policy is dictated by the managerial policy of the concerned Unit/Department. Thus,

a. Industrial enterprises protect their useful R&D results through patents for their own Commercial Interests, both as a tradeable property right and as an entry barrier to their areas orf interest by possible competitors.

b. Strategic Departments resort to patenting of their significant and useful R&D results essentially to establish the required scientific priority and leadership in public and to concurrently provide the necessary legal protection of the disclosures against unauthorized uses, to maintain steady lead in the field by building a 'paten wall 'a round the research areas of interest against encroachment/infringement from opponents, to use them as valuable 'property' elements in scientific/technological collaboration with other partners as and when required for joint develop of major mission programmes and systematic technology transfers etc and not primarily for economic gains.

c. Irrespective of the mode of utilization, patenting has been widely accepted as the tool for meaningful scientific/technological evaluation of applied R&D. Ownership of high quality patents also enhances the professional standing and prestige of the institution.

Interestingly enough all these are equally important for DAE Units.

MAJOR INVENTIONS AND PATENTS FOR THE IT REVOLUTION

The three major inventions leading to the IT possibly are

a. Launch vehicle and satellites for global communication
b. Integrated circuit leading to massive computing
c. Optical fibre for terrestrial transmission

A FEW RELEVANT PATENTS

a. US 2,397,657 on "control mechanism for rocket apparatus" by Robert H Goddard,
b. US 3,318,743 and US 4,042,948 on "Integrated Circuit" by Jack S Kilby

IPR AND GATS

GATS- General Agreement on Trade in Services

1. Telecommunication – Very important item under GATS
2. this includes satellite communication, Geostationary observation satellites, CD-ROMS
3. Commitment of WTO member contries to
   a. zero duty by 2000 A.D.
   b. respect for IPR
   c. laws to be transparent
4. Hence the reason for large increase in patents filed in India by foreigners in Electronics

WHAT IS KNOWLEDGE AND ITS MANAGEMENT DEFINED?

Thomas Davenport in his "WORKING KNOWLEDGE" describes how
DATA → INFORMATION → KNOWLEDGE

The great quote – IF HP KNEW WHAT HP KNEW, HP WOULD PERFORM THREE TIMES BETTER.

In our country

a. inadequate data
b. Inefficient information gathering, and
c. Unstructued knowledge utilization

Whether it be IIT's CSIR/ICAR/DST/ICMR OR DAE/ISRO OR TATA BHEL,

a. How good as their knowledge banks?
b. How quickly they take up a new and innovative 'Build on' work?

How can IIITM's contribute in this challenging task, apart form ocource creaing another immediate "export potential"?

SANJIV SIDHU - HIS " RAGS TO RICHES" ODESSEY.

1.The two richest Indians in the world who made their fortunes in the United States through innovative ideas in their own areas of expertise are Sanjiv Sidhu ($9.8 billion or Rs 46,000 crores) and Gururaj Deshpande ($7.6 billion or Rs 35,000 crores) , according to the Forbes compilation of the richest Americans in 2000. Both belong to the category of " techies" , the entrepreneur- products of the newly heralded IT revolution in the West. While Sanjiv Sidhu , the Hyderabad- born Indian (also the son of the distinguished father Dr G.S.Sidhu ,(Rtd) Director-General,CSIR) , made his mark essentially based on his contributions while working for the US based Texas Instruments' Artificial Intelligence Laboratory, Gururaj Deshpande got known initially for his and his colleagues' work at Bay Networks Group,Inc. on network systems.

2.A quick look into the US patents literature brings out the following:

a. Sanjiv Sindhu was awarded, along with his colleagues Subhash Gupta and Frank Vlach of Texas Instruments Inc, an US Patent 5,260,868 dated November 9, 1993 for "Method for calendaring future events in real time". The abstract of the 30 pages long patent reads thus:

"A mechanism and method for calendaring a plurality of events such as scheduling the operation of interrelated machines which perform a process flow. Future time is divided into segments called buckets, of increasing length. The first two buckets are of the same size and each of the following buckets twice as large as its preceding bucket. The first bucket slides so as to always cover a specified length of time following the current time. Events scheduled in the calendar is added to the appropriate bucket, depending on how far in the future it is to take place. When the current time equals the scheduled time for an event, then that event is removed from the bucket where it resides. When a bucket has become empty because all events have been removed from it, the events in the following bucket are distributed over two buckets preceding it."

The invention related to automated scheduling and planning systems immediately found wide acceptance in industry. And naturally there was no looking back as far as Sanjiv Sidhu was

concerned. He is currently the chief of i2 Technologies and, as mentioned earlier, is ranked 25th in the Forbes list of the richest Americans for 2000.

b. Gururaj Deshpande came on the exalted scene through his invention of " System having central processor for transmitting generic packets to another processor to be altered and transmitting altered packets back to central processor for routing " , as described in the US Patent 5,490,252 . This is related to internetworking devices and methods , and more particularly , to a broadband enterprise switch capable of interconnecting a variety of networks with maximum reliability , availability and serviceability. The situation here also was not any different , with Deshpande now being the second richest Indian in the world.

3.There are now many more " techies" of Indian origin occupying prominent positions in the West as shining examples of inventor-turned-entrepreneurs; and thanks to the current economic policies of the government of India, the number of India-based technology companies also has shown a steady increase. In other words, the Information Technology Revolution has been slowly sweeping the Indian soil as well. All the same it is also true that whereas the former ones are based on concrete innovative achievements, almost none of the latter, even the most prominent, have so far been able to establish such strengths through even a minimum meaningful invention / patents portfolio. In other words, the native IT sector has "miles to go" to withstand in a sustained manner the pressures of the Globalised Regime. Unless some of these issues are not properly realized and corrective measures taken in time by the government, its dream of a mega IT revolution may simply not happen.

A QUICK PATENTS SEARCH ON USPTO.GOV

Description/Keyword	Number of Patents
"Knowledge Management"	6
707/5 US Classification	713
Software	very large number

What do we do to find out a "Needle in a haystack"?

CARL DJERASSI AND HIS " MOTHER OF THE PILL"

1.In a celebrated science interview Carl Djerassi said:

"First you want to remember that people have a tendency always to have one person who is the 'father of ' - the Father of Penicillin, the Father of the Pill, the Father of the country, the Father of this and that. You really won't create anything by being only the Father. Clearly to create anything, any 'living' thing, you need a Mother, you need a Father and you need a Midwife. And that metaphor, if you wish, is an accurate description, it's completely relevant to this Pill, because the chemist in my book- not Carl Djerassi, the chemist – the chemist is invariably the Mother of a medical invention drug, an invention that is relevant to medicine. Invariably, because nothing can be done until the chemical entity is created. In other words, consider it 'the egg '. And the biologist in my opinion is invariably the Father, with the initial biological experiments being the sperm that float around until one fertilizes the egg….And the clinician of course is then the Midwife…The chemist is always the Mother of the invention, and it could be a male mother. The biologist is always the father and it could be a female father ".

THE NEW IPR REGIME – A SWOT ANALYSIS

a. Strength: Vast S&T and industrial infrastructure.
b. Weakness: Growth based on "others shoulders" permitted through the 1970 Act – Vast Technology Gap, not easy to cope with under the New Regime
c. Oppurtunities: Great for state of art R&D/T&D
d. Threats: Immediatefuture very favourable for essentially MNC's but very tough and challenging for Indian sector, emanating from huge technology gaps in amost all fields for original IPR consistent contribution (be they matierials, processing technologies, equipments, electronic/control systems, software or GM crops.)

The SWOT analysis, according to me, is alarming. Can we reorient ourselves so quickly as required through an administrative order in the form of a new TRIPS – compliant patent laws, I seriously wonder. Or is it that in the TRIPS negotiations, when we were pressurized to bend, we prostrated instead? If my concerns are proved wrong, I will be the happiest Indian!

SUMMARY AND CONCLUSIONS

India has now entered the international patent regime with the amended act to be in position w.e.f Jan 2005. With the process only system to be changed over to the product and process system and their reversal of the onus of proof for violation of process patents, materials research in India would necessarily have to undergo a total structural transformation, seeking new process and a new materials and protecting the proprietary interest through legally valid IPR's on the one hand and seeking the well known licensing procedures through technology/indigenisation of products patented elsewhere - in other words facing the problem, may I call it the Y2K5 problem(?) squarely.

Decades ago the great nuclear scientist A.Weinberg described nuclear energy "as a faustian alternative".

"WHO'ER ASPIRING, STRUGGLES ON,
FOR HIM THERE IS SALVATION".

For we materials scientist in India, the new IPR regime is indeed a faustian challenge.