



# **‘So That All May See’: An Interrogation of Knowledge Generation in the Post-colony**

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## **Abstract**

Discourses on geopolitics of knowledge have for long focused on distribution of knowledge artifacts as a marker of West's domination. But following Mignolo and focusing on enunciation, we centre-stage the geo- and body-politics of knowledge- the knower, known and the knowing in the process of displacement of dominance. Through an exploration and interrogation of a surgical invention in „stem cell therapy“ in ophthalmology at a clinic-cum-

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*India may have the most number of problems...but it also has the most number of solutions.*

Dr. G N Rao, Founder of LVPEI

The discourse on geopolitics of knowledge, often informed by historically constructed dualities such as the North-South, West-and the Rest, centre-periphery or the developed-developing with an implicit undertone of “*first in Europe (West) and then elsewhere*”, maps and remaps nation-states through data on global distribution of the *volume* of knowledge artifacts (KA). In recent years such statistical exercises mapping various markers of national identity on patents and other intellectual property, signal a steady growth in knowledge generation (KG) in natural sciences and engineering from the countries of Asia, Africa and Latin America (WIPO, 2014). Countries like China, South Korea, India and Brazil now appear among the top 20 scientific KG (WIPO, 2014). The international patent office has reported an increase in the number of patents filed from low income countries (WIPO, 2014). The share of science and engineering articles from US/Europe has concurrently declined from 69% in 1995 to 58% in 2009 (NSF, 2012). In the social sciences too, citation analysis has shown an increase in publications from erstwhile

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evidence of the declining gap in KG. Scholars have also reported a dramatic rise in research collaborations (Gazni, et.al, 2012; Leydesdorff, et.al, 2012) suggesting that “*the underlying social organization involved in creating scientific knowledge has been shifting*” (Leydesdorff, et.al, 2012).

Critical scholars like Gingras and Natanson (2010) have argued that globalization has adversely affected peripheral countries, reducing their autonomy and increasing their dependence on the „centre“ for KG. A plethora of studies on research collaborations, citation patterns, patent and other IPR filings identify the neglect of domestic work and privileging knowledge from the West (Gazni, et.al, 2012; Prato & Nepelski, 2014; Leydesdorff, et.al, 2014; Gingras and Natanson 2010). Studies of Critical Management Studies (CMS) scholars have also supported these broad patterns. They find that management knowledge has been produced in the West and all the concepts, theories and categories come from and privilege the West (Alatas, 2003; Fougère and Moulettes, 2011; Srinivas, 2008; 2012; Tipton, 2008; Prasad, 2015; Jack, 2015, Jack & Westwood, 2007, Nkomo, 2011).

One feature common to these studies, is their focus on the *enunciated* (Mignolo, 2009) the final artifactual form of KG- whether a patent, a copyright, a journal article, or a textbook instead of the „process“ of arriving at the artifact. Since the KG apparatus is no longer contained within nation-states in the manner of „national innovation systems“, a sole focus on the final artifact of KG process may be inadequate to map the global topography of knowledge work and the dynamics of domination or its displacement therein. As Warwick Anderson rightly suggests, „*even the most local..... should imply a network, suggesting connections with other sites through traffic of persons, practices and objects*“ (Anderson, 2002: 652).

More fundamentally however, following decolonial theorist Walter Mignolo's distinction between *enunciation* (or the act of knowing) and the *enunciated*, to examine the „enunciation“ is to understand the enunciator (or the knower), geo-

planning and policy research has examined the institutional set-up and collaborations necessary like the Triple Helix model (Etzkowitz, 1993; Etzkowitz and Leydesdorff, 1995) for effective KG and transfer within and between countries and institutions (Molina-Domene & Pietrobelli, 2012; Arocena, et.al, 2015; Audretsch, 2014).

One strand of critical research has focused on citation studies and highlighted continuing domination of the West. According to Gingras & Natanson (2010) for the period 1980 to 2007 in their study of 1162 journals, Europe and North America together contributed 92.6% of the journals and 90.2% of articles between 1980-2007. ). Their study also found that central actors in the field tend to concentrate their citations on the central journals and countries, thus neglecting contributions from outside Europe and North America”. The study also describes another trend where North American and European collaborations sought by African, Asian and Latin American authors had more than tripled by 2005 compared to 1980s indicating a greater dependence on the prestige of the „centre amongst those in the

of knowledge. Some, following Sandra Harding (1994), have demonstrated the colonial roots of modern Western knowledge. Yet others have focused on resurrecting subalternised epistemologies and knowledge systems in fields as diverse as medicine, technology, agronomy and management. Postcolonial CMS have also revealed domination through modern social science knowledges of management and development (Jammulamadaka, forthcoming; Alcadipani & Faria, 2014; Frenkel and Shenhav, 2006; Alcadipani & Cooke, 2013) and the need to make room for subalternised knowledge systems (



writing and subjectivities of Cervantes who writes Don Quixote and Waman Puma a native Quechua writer and thinker who writes in broken Spanish “*Nueva coroniza y buengobierno*”





the questions which the text answers (Prasad, 2002). Such understanding, while necessarily located in the present and accessible only through the interpreter's own prejudices, goes beyond the intention of the author (Prasad, 2002; Gadamer, 1975). A long standing practice within social sciences treats social and economic phenomena and not just written word as texts (citing Ricoeur, 1971, Prasad 2002, Phillips and Brown, 1993). Following Prasad (2002) and Prasad (2005) we draw upon postcolonial theory that is suited to our specific geo-historical location to provide critical self-reflexivity to the process of interpreting the text.

### **Data and Method of Analysis**

The specific „text“ this study analyses is an ophthalmological surgical technique called “Simple Limbal Epithelial Transplant” (SLET) developed by Dr. Virendar Sangwan of L.V. Prasad Eye Institute (LVPEI) of Hyderabad, India to treat one kind of corneal blindness. The „context“ for this study has been identified as a) historical evolution of the technique within LVPEI, b) evolution of and regulation of ophthalmic stem cell (SC)

LSCD were consulted. We analyzed the abstracts of all published work of Sangwan between 2001-

- c. Identifying the specific constraints, opportunities, inspirations, insights, that enabled and supported

(Takahashi & Yamanaka, 2013). Around 50% of the work on SCs is happening in the field of regenerative medicine (Barfoot, et.al, 2013). SC technology started developing in the late 1980s, one could therefore possibly argue for the existence of a notional level playing field outside the historical effects of colonization. Thus, focusing on SC technology for our study makes it possible to look at contemporary dynamics of enunciation under domination in the „*emerging global order* of scientific KG (Andersen, 2002). SC technology witnessed rapid growth upto mid 1990s and settled down to around 200 patents per year towards the end of 1990s (Bergman & Graff, 2007). USA has the highest 21% share of patent filings in this technology followed by EU (14%) (Bergman & Graff, 2007). Within SC technology, SC transplantation is one of the top areas of research (Li, et.al, 2009). We therefore chose to focus on SC transplantation research. For our research site, we chose LV Prasad Eye Institute (LVPEI) which is recognized as a global leader in SC transplantation surgery of the eye and a WHO Centre of Excellence in eye care clinical services and research ([www.lvpei.org](http://www.lvpei.org)). LVPEI was established in 1987 by a corneal surgeon Dr. G N Rao in Hyderabad in India. Dr. Rao was driven by a desire to provide excellent eye care to the people of his native state and therefore he had come back from Rochester. One of the corneal surgeons at LVPEI, Sangwan developed SLET surgical technique for treating blindness caused by damage to the eye s corneal SCs. This surgical protocol is now practiced globally as a highly effective treatment.

## **Findings:**

portions of LSC tissue (about 2 mm) were taken from healthy donor eye and SCs were cultivated into a multilayered (3-4 layers) differentiated corneal tissue in the lab using artificially derived and/or non-human media, growth factors and feeder cells. This cultivated corneal multilayer was then transplanted into the damaged eye. CLET had good clinical outcomes for recipient eye and ensured safety for donor eye but had two important downsides a) safety risk due to non-human

across the world and brought them to his patients. He had practiced both CLAU and amniotic membrane transplants (another technique proposed in mid-1990s by Tseng's group).

Abreast as he was, bringing CLET to his patients was a problem for Sangwan. LVPEI did not have a developed SC laboratory for growing a SC multilayer; nor was he formally trained in SC biology. Yet, he tried. He collaborated with a cell biologist at his institute and used the institute's seed funding for research. In absence of air-lift equipment, a standard technique of growing SC in US and Europe where after growing SCs for three weeks in a medium, the medium level is lowered to provide an air-liquid interface that promotes stratification of epithelial cells for another week, Sangwan and his team cultivated monolayer epithelium in submerged conditions. Microscopic analysis of their monolayer sample showed varying stratification along different parts of submerged culture which led them to hypothesize that there was an inherent property of SCs to stratify. Even though they found evidence of stratification and a high percentage of surviving SCs in their technique, they could not actually produce a multilayer tissue in the lab. This handicap was interfering with Sangwan's ability to treat his patients. He therefore approached LVPEI's institutional review board (IRB) for permission to transplant a monolayer instead of the multilayer used in a conventional CLET procedure. IRB did not agree initially but was eventually persuaded with lab data on inherent stratification propensity of SCs. Invoking the principle of „informed consent of patient“ IRB members personally ensured that Sangwan had explained risks to patients by participating in patient briefings. Finally Sangwan got a grant for 20 trials from Department of Biotechnology (DBT), Government of India and he began performing monolayer CLETs. In routine post-operative reviews he found that the cornea did indeed grow normally and that even the feeder cells (whose behavior was not yet understood by science) had integrated normally into the cornea. Thus Sangwan learnt that their hypothesis

about the inherent disposition of the SCs to stratify was not completely incorrect. The early results were published in

and other associated markers<sup>8</sup>. The Pellegrini group contended that it was necessary to identify and predict the exact number and growth rate of donor SC tissue and developed markers for the same.

## **Developing SLET**

In the continuing efforts at refining protocols, Sangwan's team started working with Prof. Sheila McNeil of Sheffield University, UK, to develop a suitable biomaterial that could be a substitute for the currently used human amniotic membrane. Only a licensed tissue bank could store amniotic membranes. An „off the shelf“ biomaterial would expand access since surgeons without access to a tissue bank could also perform the surgery. In one of the



## **State of science**

Regenerative therapy based on SC transplantation seeks to insert a „living SC into the human system. To achieve the regenerative function this cell must continue working within the recipient microenvironment. The interplay between SCs and the surrounding microenvironment create complex recurrent causalities between different elements, thus cell growth is governed by a complex process. One popular research approach - cell biology based approach elucidates these complex interactions before designing therapies through tissue engineering to mimic in vivo biochemical and biophysical microenvironment (Pellegrini, 2014). Existing scientific knowledge on complex cell interactions enables the design of a concrete and closed therapy in the form of a standard product in which many of the indeterminations and variabilities of the process are absorbed and suppressed through a step-wise resolution of small Simondonian „*disparations* . This has been the strategy adopted by Pellegrini group, Tseng group and others in making Holoclar (Pellegirni group) and amniotic membrane based product ( Tseng group). Such productization enables easy commercialization of the therapy.

It also enables the creation of a revenue and profit stream in the form of a patented or trademarked product – a concrete portable technical object- leading to recovery of research costs. A patient seeking treatment through Holoclar has to necessarily get hooked into the central SC manufacturing facility of the firm to produce transplant tissue, the patient also has to rely on immunosuppression, in the process creating a circuit of commerce through which Holoclar could travel. This concrete portable technical object leads to technological determinism (Simondon, 1980p. ) in the Simondonian sense because it incites the need for a whole supporting infrastructure, which and only which will enable the „concrete portable technical object to

perform healing. Due to these revenue possibilities, cell biology research often attracts funding. It also operates within a strict regulatory regime designed to protect the patient against the risk of variation and commercial exploitation.

Another research approach, the clinical research approach, often advances novel therapeutic propositions (such as surgical techniques) picking on different leads provided by cell biology research and prior clinical trials. Clinical observation of proposed techniques (through trials) in turn leads to generation of new information. The open nature of this approach to technology, in a Simondonian sense, makes proposing design of experiments and generating data important in taking forward a research track to stake a claim in KG. For instance, while limbal location of corneal SCs was hypothesized both through animal model and cell marker studies, it was the clinical success of Kenyon and Tseng's CLAU surgical procedure that provided a strong indirect evidence for the hypothesis. This clinical invention, not only proposed novel treatment for LSCD, it contributed to further cell biology knowledge of limbal cells. Surgical interventions thus were invented with incomplete knowledge and their clinical outcomes supplied the necessary hypothesis. Yet CLAU's associated risk of donor eye LSCD created a *disparation* between the requirements thrown up by recipient and donor eyes. CLET provided a solution to donor eye

multilayer transplant tissue to help his ever-present patient load provided him the necessary  
„instigation for a Simondonian transductive creative leap where the „absent multilayer became  
„surviving SC monolayer . Historically, every



researchers around the world he could have easily developed the medium into a proprietary formulation and turned it into a revenue stream. However, he and his team chose to disseminate their knowledge widely in the form a protocol so that all those who needed it could easily use it. Explaining the motivation behind the leap to SLET, Sangwan et.al (2012) writes, “*Currently, opinion is divided about which of the two existing techniques...is a better... Both techniques are*

*opportunity of exploring all the techniques of SC-based therapy for ocular surface reconstruction .... This unique experience has given the authors an enviable perspective on the subject that no other group in the world can currently claim. Through this article the authors have tried to share their vast experience and clinical perspective on this subject and make recommendations based on rigorous scientific evidence.”*

At every step, the socio-economic-cultural– institutional characteristic of Sangwan s location translated either into a scientific objective or a *disparation* for Sangwan and his team. It translated as cost of treatment, cost of production, circumvention of animal models, ease of practice, ease of dissemination, expansion of access, lack of infrastructure and so on. Similarly the *transductive* leaps of imagination which invented the technical objects became possible because he viewed the recipient eye not as a passive, neutral or empty site waiting to be filled up but as a site of healing potential, an eye of a poor person living in a village who did not care to know what the state of knowledge was but needed relief as soon as possible. It also moved beyond the boundaries of nation-states or the „national innovation system and dialogued with ease with fellow researchers around the world and did not hesitate to draw upon and give back to this collective heritage of human endeavor.

## **DISCUSSION**

Our exploration and interrogation of the evolution of a technical object through interplay of the socio-economic and cultural sensibility of a geo-historically located innovator surgeon and the logic immanent in the technical object in its evolutionary formation brings us to the issue of geopolitics of knowledge. Mignolo (2009:2) has categorically stated that “*geo-politics of knowledge goes hand –in-hand with geo-politics of knowing*”. Western epistemology has



the imprint of the locus, so has the „known in terms of the „eye . The eye on which Sangwan and his team worked too has been racially implicated as the eye of the poor man/woman who cannot afford to lose a livelihood due to blindness. The fellow „surgeons whom he trains too do not have access to massive infrastructure that a CLET would need; hence the „known had to work in their specific circumstances.

Sangwan's invention and knowing has been possible only by an „





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