The Enchantment of Manali

Snow-can Rushdown*

ABSTRACT.

A long time ago in a place far, far away... snow was plentiful in the high countries, and glaciers were advancing worldwide. Snows were particularly heavy in the Himalaya, the great arc of mountains that formed the northern border of the empire of Akbar, son of Humayan. To Akbar, snow was more than an enchantment to provoke scientific discussions, snow was an essential part of hydrological and ecological Earth that gave life to agriculture in the Panj āb (the land of the 5 waters). Akbar was particularly concerned about the ever-increasing pressure of changing climate, as the Earth was then beginning to plunge headlong into the Chhotti-Baraff-Ka-Samay (Little Ice Age). Accordingly, Akbar asked his trusted scientist, the Maharājā of Manali and the court of wise people of the Snow and Avalanche Study Establishment (SASE), to call together a meeting of scientists from around the world to discuss all things known about snow. This is the true story of the International Symposium on Snow and Avalanches, held in Manali, Hindustan (to be called India 4 centuries later).

If there is a knower of snows here, fetch him: There’s a strange snow on the mountain side, her way of moving is like no mortal thing, but of a breath-like, powdery form, and she threatens to run down on a destructive path. [Mirza Ghalib, translated by D. MacAyeal]

Dharma is better than Artha, and Artha is better than Kama. Artha is naturally practised by the directors of scientific laboratories, for the livelihoods of scientists depend on it. Kama is practiced by snow scientists, because they love their work. Dharma is achieved by those who devise shelters that protect people and traffic from avalanche danger. [Kama Sutra, translated by D. MacAyeal]

Scene 1: A traveller from far-away Europe, Magnús, arrives in Manali.

*Born in Mumbai, India, and author of 9 previous novels, including Midnight’s Flowlaw.
In the day’s last light, the shiny snowy mountain sides above the science-place called SASE looked like a sea of shimmery silver embedded with bright diamonds. There on the valley floor was the shimmery golden thread of the Beas River. This river was once called the Hyphasis by the ancient Greek legions who refused to cross it when Alexander III of Macedon extolled them to extend their conquest into Hindustan. This river also fed the Sapta Sindhu, the sacred 7 rivers, of the Rigveda.

The traveler rode in a bullock-cart marked with the banner-of-passage provided by the Ksatriya, Colonel Rajesh Seth, who was the giver of boundless hospitality and ensurer of security in these lands. The traveller wore a colorful vest atop his dhoti that was bespeckled with the azure ink of leaky pens, and his lapel bore the blue color of a precious lapis lazuli pin lettered with ‘IGS’. He claimed to be an emmisary of an ancient learned society concerned with Glaciology that was established in the land of Queen Elizabeth (Elizabeth? First or second? It does not matter for this story). This traveler to the science-place called SASE was Magnús of Ice-istan, descendant of the great Magnús Khan, and progenitor of the man called Magnússon who, 4 centuries later, would become the secretary general of the IGS.

The Magnús had come to Hindustan with two purposes, first, to attend the durbār of scientific wise people called by Akbar himself, and second, to deliver a magical secret so divine that it could only be heard by the Rajput of snow science, the Mahārāja of Manali himself.

Scene 2: The Magnús is awestruck by the pagentry of the Mahārāja’s court (SASE).

The Magnús quickly found that the scientists of Hindustan were awe inspiring, because their stories were better, their papers more numerous and dramatic, their field work more energetic and precise, and, most of all, because they somehow managed to thrive in a land where every-day traffic on the streets was more chaotic than a raging avalanche.

The opening of the great gathering of snow scientists was made festive by a troupe of Himachali dancers who performed the Kayang Mala, the garland dance, to the deep-noted sounds of their long trumpets. The place of lectures, the Diwan-i-Khas, was scented by the petals of thousands of marigolds and was named after the rare mountain rose of Himalaya, the Saichen. A luscious feast was produced for the Baraff Tootna (ice breaker) in the hall of the Mahārāja’s great military men. The food was plentiful and exquisite, including Kashmiri Biryani and Rogan Josh of intricate flavors and Kheer so sweet it would generate pleasant dreams for those whose travels brought them across many time zones. The food was enjoyed amidst the enchanting rhythms and poetic verses of Samunder Khan and his troupe of Rajasthani musicians who had travelled to Manali after being in the New World, where they had played many concerts in the Diwan-i-Carnegie of New York. [Insert a statement about the Thursday night music program.]

On the middle day of the great gathering, the Mahārāja of Manali commanded his efficient and trusted Ksatriya Colonel, Rajesh Seth, to amass a large caravan capable of transporting the raucous mob of wise snow scientists, along with their lackeys (graduate students) and laptops, across the harsh mountain roadways to the distant snow-research palace called Dunde Station. This station was the special shrine where the inner workings of snow were discerned by snow-whisperers, and it was located at the base of the high and rugged Rhotang Pass that joined the Kulu Valley to the moon-scape of the Spiti and Ladhak valleys. Along the way, an engineering marvel was beheld by the caravan, as they stopped to inspect a tunnel over which terrible avalanches would pass, leaving future travellers unharmed. On reaching the Dunde, a great magical feat was performed, as an entire mountain-load of snow was compelled to avalanche down a chute festooned with instruments used to advise the Mahārāja on the conditions that influenced safe passage across the mountainous roads of his realm.
Scene 3: The Magnús is amazed by the lectures given by the 9 jewels of snow science.

During the great meeting, the Magnús was impressed by the lectures of the Navratnas, the 9 Jewels, of snow science, who were known far and wide as the greatest of all glaciologists:

The first Navratna to lecture in the Diwan-i-Khas, in the Saichen auditorium, was Sivaprasad Gogineni, an ice-whisperer who lived as a humble man during the day, but at night flew in strange silver birds that had mighty eyes which shot invisible rays downward so as to see beneath the surface of things by the ray’s reflection. This first jewel of snow science could count layers in snowcaps and find farmer’s goats that had fallen to the bottoms of ice crevasses.

And then there was M.R. Bhutiyani, a cutter of stones from Jaipur who fashioned beautiful carpets out of dust and snow that adorned the sides of mountains, and thereby changed their albedo to better alay the Mahārāja’s concern about the Chhotti-Baraff-Ka-Samay (Little Ice Age).

Several of the 9 jewels of snow science came from distant colonies of the new world and from city-states of Europe. These included the wise Boyar from Mockva, Sokratov, who carried a scale so precise that he could tell which snow flakes were reincarnations of droplets from a warm, tropical environment, and which had cycled from a brutish, heavy life in the far North.

There was the indomitable diviner of the Swiss Alps, Schneebeli, and his enchantment was a fierce, but righteous, sword that he called the SnowMicroPen (SMP) penetrometer. With this instrument, it was said, the 4th Jewel of snow science could discern the most subtle, and secret-most intentions of a field of snow to the Kama of rapid downhill motion.

Lest the world be seen as only a precise, careful working with no room for natural intervention, the 5th Jewel was a man of Scottish Ilk, McClung, who boasted the crass workings of the Rutchblock—a method of snow-monument excavation that was later to be tested and rejected by the artisans who built the Taj.

There was the 6th Jewel, but he did not count as precious, as he was the Sahib Bay-Waqoof, the central clown of foolishness, Mac-A-yeal who hailed from the land of smelly onions (Chicago).

The 7th Jewel was the just governor and keeper of SASE’s treasury, the great R.N. Sarwade. As the Kama Sutra advised, Artha is best practiced by directors of laboratories, for they are most practiced at pulling together material and intellectual resources to produce milestone scientific conferences.

There was the 8th Jewel, Pant who soared in gossamer Aerostats (magic balloons) festooned with cameras to amuse the snow scientists by showing them what a hawk could see from high above the snows.

And finally, there was the 9th Jewel, a great organizer of caravans, a builder of campsites and maker of great merriment and comfort, the chief of the Mahārāja’s security, the Ksatriya Colonel, who had once lived a former life as a bull elephant, but was now devoted to the capture of the Sahib Bay-Waqoof, who’s elusiveness and sudden departures would otherwise mean that IGS council meetings would be held without a proper clown (shudder to think!).

All of these Jewels of snow science were there, and all gave talks; however, the time eventually came for the Mahārāja to ask the Magnús about the special secret.
The Magnús reveals his secret.

After many nights and many days feasting and partaking of the cool fragrances of valley vegetation surrounding the great science-place in Manali, the Mahārāja, became suspicious of the foreign traveller Magnús. Was he simply a hearald that brought scientists together each year to hear each other’s songs of merriment? Was he just a hounder of dues to those who’s journal subscriptions had lapsed? Or was he a conjuror of great power who had enchantment beyond that of any of the great wise snow scientists gathered at SASE?

The Mahārāja of Manali: “Magnús, I am amused by your presence and by the efficiency which you have lent to my people in the organization of this great meeting. But, my patience grows thin, tell us your secret, your special secret so divine that no ears can hear it save my own, or I will sentence you to labors as a foreign-born (and thus incompetent) taxi driver in the crowded streets of Dehli!”

With a flourish of great politeness, the Magnús bowed low, almost tipping his Himachali chapeau from the top of his head, and he began to speak.

Magnús: “Şāhib, I have met a Brahmin named Jürg Schweizer from Davos, the beautiful city of the League of 10 Jurisdictions, who sees far into the future of IGS meetings. He has told me of things to come— to come 20 generations in the future, to come in April of 2009, to be precise. Here is what I learned:

“In April of 2009, almost 400 years into the future, Şāhib, there shall be a better meeting of snow scientists, a meeting not of 9 Jewels of snow science, but of more than 100 Jewels whose wisdom and research power will amuse and advise wise citizens from around the world. Open your ears, for I shall now tell you what the Brahmin, Jürg, said about this future symposium:

Impressions ISSA 2009.

1. Great hospitality. Many thanks for a wonderful experience.
2. Ruggedness of the Himalayan range.
3. Challenge SASE is facing with avalanche and snow forecasting for these ranges.
Avalanche forecasting for this vast area will obviously rely on weather parameters as SASE is far away from the location where forecasts apply (i.e., office-based forecasting). We have seen excellent attempts to downscale output from meteorological models combined with remote sensing data to the local conditions where the decisions need to be made. Still, precipitation is the least accurate parameter. Then, even with advanced forecasting tools, the decisions need to be made by experienced local forecasters who know their conditions and their terrain.
4. We need observations for the models and for local decision making.
We have realised in the last couple years that the way we do our observations affects the results we get (Heisenberg has figured that out some time earlier). Still most our observations methods are destructive. However, we have seen great progress in the application of the radar technology. And, there are the first attempts to not only retrieve quantitative (binary) snow cover information, but also qualitative information on, e.g., the properties of the snow cover surface. A novel destructive measuring
method has been introduced about 10 years ago: the SnowMicroPen (SMP). It is very impressive how that instrument has found its application around the world for a variety of studies from the Himalayas to the poles.

5. Appreciation of the Microscale.

Many phenomena, including avalanche formation, have their roots at the microscale (and depend on the properties of ice). Combining computer tomography ($\mu$CT) and numerical modelling techniques has significantly improved our understanding of snow metamorphism, heat transfer, etc. More of that! In avalanche formation we have a debate in the last 1-2 years: shear vs. collapse and we have seen two presentations that shed some light on that issue. It is quite clear that, due to the highly porous nature of snow, any failure will result in structural damage which will manifest itself as collapse. The collapse is a source of gravitational energy that might well be available for fracture propagation. So clearly it is shear and then collapse. Whereas in Europe and North America much research is devoted to the artificial triggering of avalanches, largely because the majority of avalanche fatalities are recreationists, natural release is probably more a concern in the Himalayas, and one contribution has considered triggering of snow avalanche by earthquakes.

6. The merging of of brilliance (e.g., model development) with passion (application) for the avalanche phenomena.

It is best when brilliance meets application/passion.

7. Inability to make precise prediction.

When forecasting large destructive avalanche we deal with rare extreme events, within the tails of the distribution. Consequently, forecasting becomes very difficult to say the least. There was one very interesting proposal: dynamic avalanche hazard map. But, an avalanche hazard map is an avalanche hazard map is an avalanche hazard map..., i.e., an avalanche hazard cannot change from one day to another. Avalanche hazard maps tell where not to build a house. But, providing local forecasters with real data specific to their problem, not just downscaling the regional danger, that is the intriguing feat.

To conclude, we are all keen to come back in particular to see the progress on the Rhotang tunnel project and see the planned avalanche defence structures at work.”

The Mahārāja of Manali: (Upon regaining his consciousness, as if having been put to sleep by the soporific effects of the 9 lectures heard previously, the Mahārāja of Manali looked alarmed and cried out.) “This secret is wonderful! This news about the future ensures that the heavenly spheres shall be well ordered, that the Nine Schools of snow-flake geometry shall be remain intact, and shows that the Sixteen Predicaments of Avalanche Dynamics and the Eighteen Steps to Snow Crystal Metamorphosis, and the Forty-two Unresolved Glaciological Issues will continue to be amusing puzzlements! To honor your secret, I shall conjure a magic spell that will so enchant the participants of the 2009 meeting (many years into the future), that they shall long for a return to the place that shall be called India well after the 2009 conference is complete! I Proclaim that there shall be many more meetings in India even after the 2009 meeting is nothing more than a poem in volume 54 of the Annals of Glaciology.”

And with that, Mahārāja of Manali thanked his people for organizing such a great meeting, dismissed the wise people to begin their homeward travel, and allowed the Magnús safe passage to visit the Fatepur Sikri on his Bullock-cart (but that is another story, with another secret that shall be revealed after the next IGS meeting in India).
Fig. 1. The *Magnús* (background) sits at ease with the IGS President, Eric Brun, and with the conference *Şahîb Bay-Waqoof* (official fool), Doug MacAyeal, overlooking the Beas River Valley above Manali.
Fig. 2. Himichali dancers perform at the conference banquet.
Fig. 3. A snow scientist embarks on the elephant caravan to the Dunde Snow Research Station.
**Fig. 4.** The great Colonel mandated the building of a road for the caravan of snow scientists.
Fig. 5. The elephant (Toyota) caravan proceeds to the Dunde Snow Research Station.
**Fig. 6.** The Mahārāja’s military men provided comfort, security and good humor during the trip to Dunde.
Fig. 7. The Mahārāja’s Colonel, a reincarnation of a bull elephant. Eric Brun, at right, a reincarnation of the Sun King of France. (Drink and cigar in foreground, owned by the Ṣahib Bay-Waqoof.)
Fig. 8. Snow scientists charming skeptics with musical lectures and salutations.