Vignettes from

Indian Rāgas

Part I

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Prelude

I anticipate some debate over nomenclature right away: ‘Indian’ is nebulous, considering our history and diaspora. I use the word with purpose, perhaps with a guarded sense of optimism. The word ‘rāga’ roughly translates to ‘hue’, or in a more abstract sense, ‘mood’. One might prolong the etymological argument to any length (but not today).

How many moods will you say are there? Two (sad, happy)? Three (sad, neutral, happy)? Five (depressed, sad, neutral, happy, euphoric)? What about melancholic? Or stoic? Ecstatic? And what about grimly gay? Saddened but relieved? Deliriously hurt? Indeed, the spectrum of moods blend so much with one another that any attempt at classification seems like, to borrow Steven Pinker, ‘cleaving the wind’.

The system of Indian music has made a serious attempt at a classification, and associating each mood with a certain repetitive combination of sound and silence. I should now clarify that ‘rāga’ is specifically the mood, and not the sound. But over time, the usage has become interchangeable.

The aforementioned ‘sound’ must have a frequency, amplitude and waveform (quality). Herein Indian system of music differs significantly from western staff notation. If anybody’s tried playing a piano from staff notation, she must have cherished the free flow of the notes, venturing far from the tonic (*leitmotif*). Because the notation is based on absolute frequencies, one need not be reminded of the tonic all the time. In a piano, there is one and only one ‘C’ (per octave), which is defined by a fixed frequency (260 Hz or its multiples). Thus the notation

C D E G A C^

Means only a fixed set of frequencies in a piano. In the Indian system, however, the same can mean any number of notes. This is because the Indian system (which, till very recent times, did not have a written notation) is *relativistic*. The meaning of a certain set of notes depend on the ‘C’ of choice. Any given frequency may be chosen to be ‘C’ (tonic) and the rest would follow.

The flipside of such a system is, to find any other note (such as G), one needs to be constantly reminded of the chosen 'C'. Thus, attend any performance of Indian music and you will find, behind the flamboyant exponent, a meek little soul constantly harping on 'C'. The instrument of choice for this purpose is the simplest you will encounter: the *Tanpura*. Even simpler ones, with one string (such as the *Iktara*) serve the purpose very well.

If you have attended such a concert, you might have also marveled at the duration of the performance: a typical recital would last not less than an hour, and there are no upper bounds. Often, there would be repetitions in between, the same motifs would be sung/ played over and over again, with just about enough variation as not to be monotonous. I have always wondered why they repeat the same lines again and again. Finally, it hit me. How often does it happen that you wake up in the morning with a thought, and it plays over and over throughout the day? The issue might be ephemeral ('I need to recharge the TV today') or something more substantial ('Should I tell it?'). You *know* that queasy feeling — unable to shake off a whiff of thought! It goes on reverberating inside you, cajoling you in many moods ('Should *I* tell it?'), always trailing your mind, never quite done.

If you have known that feeling, you will feel right at home with Indian music.

The framework

The wide range of moods have been classified into ten major 'styles' (or *thāt*), because ten is a nice number (and everybody likes ten). The aforementioned *thāt*s have quirky names, and each provides a framework for numerous moods or *rāga*.

The simplest of these *thāt*s is 'Bilāwal', which is defined by the full set

C D E F G A B C^

How to use these notes, where to pause, how long to spend on each note, how to permute them — and such intricacies — have been left to the individual rāgas. One rāga, eponymously named 'Bilāwal', uses the full set as follows.

Ascending

C D E F G A B C^

Descending

C^ B A G F E D C

A word on notation: **bold** indicates a stay of 3–4 seconds on a note (the *Vādî*), and *italics* indicates 1–2 seconds (*Samavādî*). Also, it would help if you have a harmonium/ keyboard/ piano as you read along, just to get a feel (hint, the first white key in any keyboard is usually C, and also the eighth, the sixteenth and so on).

Instruments

Sound needs a material medium to generate and be transmitted. Instruments can broadly be classified (to borrow terms from Calculus) as

- continuous — those which can produce all frequencies (albeit within a defined range), i.e. strings and airpipes
- discrete — those which can produce only a few select frequencies; the piano is the prototype

Continuous instruments

All string instruments and airpipes (including the human voice) can produce any frequency within an interval. Continuous instruments have prevailed throughout the development of Indian music, and many motifs of Indian music (such as the *meer*) have been shaped by continuous instruments. The use of intermediate frequencies is characteristic of Indian (as well as many far eastern forms like Gamelan) music.

A special class of continuous instruments are vibrating membranes, which have developed independently across cultures: the *tablā* and *mṛdangam* (and similar) in India. They can produce all frequencies within a very limited range, which qualifies them to be included in this class (with proper tuning, the a set of tablās may be played as an one octave piano).

In addition to being a continuous instrument, human voice can also produce a variety of waveforms, thus generating sounds of different quality and textures, which makes it a popular instrument of choice.

Discrete instruments

This class includes only a handful of instruments, the piano, the harmonium (a not so ancient replica of the piano), the accordion and similar. Discrete instruments make notation easy, so that music can be written and passed on. One only needs a set of symbols for few select frequencies (12, for a piano).

Distribution of frequencies

Traditionally, an octave in Indian music consists of 22 notes (the Sanskrit term for a single note is '*śruti*', which means, simply, 'listening'), whereas ,the piano defines an octave of 12 notes, which are as follows

C C# D D# E F F# G G# A A# B

(In western notation, the '#' symbol indicates the black keys immediately following a white key on a keyboard.)

This begs the question: where are the 10 other notes (*śrutis*) ? Well, they are still there, but can not be played on a piano. Because Indian music has grown up with strings and airpipes, the resolution of an octave is etched in greater detail. Between C and C# lies one *śruti*, one between C# and D, and so on; śrutis are exclusive to continuous instruments, and vocalists often use them with abandon.

Notation

I will use a keyboard friendly version of the Bhatkhande system for the 12 notes in a harmonium. Note that the frequencies in a piano and a harmonium almost never correspond to each other, but are always slightly off. This is by design and reflects the difference in the two cultures.

The 12 notes in an octave are

*Sā, komal re, re, komal gā, mā, tívra mā, pā, komal dhā, dhā, komal ni, ni, sā^*

Or, more succinctly

S, r, R, g, G, M, m, P, d, D, n, N, S^

There is no particular reason why the note just before re, gā, dhā and ni are called ‘komal’ (soft) and the one just following mā is called ‘tívra’ (?harsh). However, the names are recent (19th century) and have stuck since.

The set of notes may be overlaid over any 12 consecutive keys on a piano. For your convenience, you can start playing them on the piano beginning from the first note (assuming C=sā), so that the black key following C becomes komal re (C#= komal re).

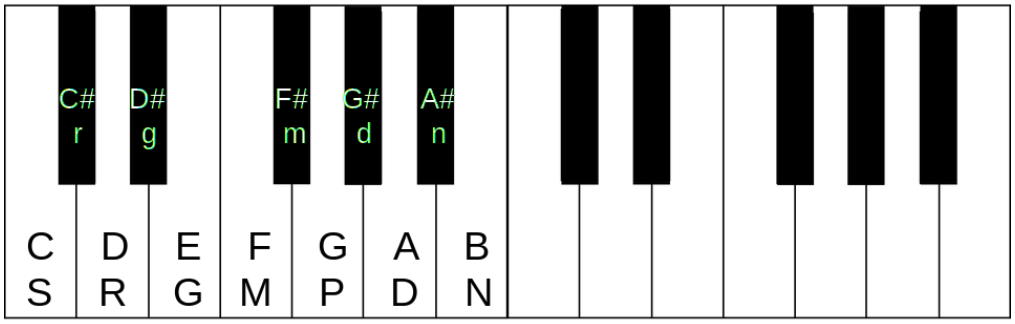

Illustration 1: Here we choose an the middle C in a piano as 'sā'

Next on, we will flirt with the concept of *time*.

Time

Underlying all the intricacies of music lies the core idea, that of time. Musical notes have a certain frequency, which we perceive as their pitch. In addition, the time duration of notes (and gaps between successive notes) determine the tempo of the piece.

The unit of time is a ‘mātrā’ (?meter), but like a lot of things Indian, it is not an absolute unit. Instead, one can chose any arbitrary duration of time as a mātrā. A

mātrā in a *khyāl* (‘a passing thought’) is typically around a second, while in a *dhruvapad* (‘constant’ or ‘cornerstone’, another genre!) it might stretch to 10–15 seconds, or even minutes. It is even allowed to adopt a different mātrā midway along a recital, speeding up or slowing down things at will.

Rhythm

A set of mātrās make up a definite rhythm, which are in principle, similar to many familiar western rhythms: a 4–4 rhythm, or a 3–3 rhythm (Waltz). However, this is where the similarities end.

Conventionally, western rhythms are played on drums, which are discrete instruments, and can not smoothly swerve between two beats. However, Indian rhythms are played on continuous instruments, like the tablā. This gives the rhythm a very roundish feel, with its own tunes, motifs, ascents and descents.

When a rhythm is played on a continuous instrument, we call it a *tāl* (I can not overemphasize this central concept of Indian music). Numerous tāls have evolved, many with 4–4 rhythms (tín-tāl, kāhārbā, cautāl), with 3–3 rhythms (dādrā, ektāl) and a few oddities like 5–5 (tívra), 7 (rūpak) and 10 (surfāktāl).

The maths of a tāl

Any rhythm, like a 4–4–4–4 (that of tín tāl), adding upto 16 beats, can be fragmented in several manners

3–3–3–3–4

4–4–2–2–2–2

4–4–3–3–3–3–4–4–4 (= 32 beats, i.e. two rounds of tín tāl)

3–3–3–3–3–3–3–3–3–3–3–3–3–3–3–3 (=48, i.e. three rounds of tín tāl)

Here is someone to whom all this math comes naturally (by ‘naturally’ I mean decades of practice): Pandit Kanthe Maharaj performing a very complex set of maths (with odd-numbered rhythms) which merge so smoothly into each other that

you will need a pencil to even grab at it: https://youtu.be/P2hc6aT0Jnw. Try tracing the beats on a paper and feel your brain melt.

Time of day

This confounds everyone. Why do Indian rāgas have to be played at a specific time of day ? What happens if I play *Mālkośh* at 9 in the morning?

Well, nothing, at least nothing that we know of. But this has been a sore point, for me, as well as many renowned exponents of Indian classical music. So I will digress a little.

It is a given that we do not experience a full day properly. We live in closed spaces, almost never see the dawn, wake up late in the morning, rush and choke through the day, spend our evenings in neon lit streets, go on texting in artificial light till late night. There is no point trying to recover our biological clock. It has been reset, and might take years of abstinence from urban civilisation to set it back.

Through most of our history, the day began at first light, people had to walk over grass (to complete their ablutions), work a full day in fields, retire to their home by sunset. In the absence (or dearth) of artificial light, bedtime used to be early. The sun and the moon were in complete control of our biological clocks, and consequently our endocrine system, our heart rates, blood pressure, and the way we feel throughout the day. Even our ears were attuned to a few specific set of sounds: flowing water, human voice, chirp of birds, animals, rain and thunder, and that's about it. This used to be our auditory vocabulary for thousands of years.

Now that our sights and sounds have changed, our physical bodies are still struggling to catch up. Cortisol, the dominant steroid hormone, is supposed to reach peak blood levels at dawn (in fact, levels of cortisol trace a sinewave throughout the day); but in a lot many it doesn't. The 'rhythm' of our endocrine system is undergoing a makeover. Menstrual cycle (a word that derives from 'moon') is supposed to be just that, a 28 day cycle; except in the large proportion of women where it isn't. There has been little progress in finding endocrine rhythms in the

brain (it's complicated). If we go by the standard model of medicine, that mood (rāga) is determined by the mileu of hormones and neurotransmitters in the brain, then it makes perfect sense that the timing of rāgas have lost their meaning.

But the remnants of the buried past still crop up! Make sure its broad daylight (9 o clock in the morning is a good time), open up a piano (or an app) and play *Mālkośh* (or Malkauns): it's the easiest to play — just hit the black keys (of the lowest octave) in any order!

G#` A# C# D# F# G# A#^

(the backtick ` denotes an octave lower), or, in Indian notation

n` S g M d n S^

(Note the komal ni, komal dhā and komal gā). *Mālkośh* is the mood of fear, or more specifically, *dread*. Do you feel any dread sitting in your office cubicle in a sunny morning (apart from the constant fear of the coffee machine running dry)?

Now perform a dare: venture into some remote corner in a jungle without electricity (there are many), find a deserted log cabin, carry your string instrument of choice, and play the same notes at middle of the night (*Mālkośh* is a midnight rāga). I don't guarantee anything, except that the experiment is worth it (I tell from experience).

Whether the timing of rāgas mean something is a matter of research, which, unfortunately, do not seem plausible in the electronic age. And that's that. No point harping on a hypothesis. Next up, another central tenet of Indian music, the mechanism of listening.

Listening

Listening is a faculty (and also a skill) which needs its own 101. Nevertheless, I will outline the key features of perception of sound.

Sound is a vibration transmitted through a material medium: evolution has provided has receptors for vibration in the skin, bones, joints, blood vessels, and everywhere else. We listen with our entire body, so to speak; notably, these

dispersed receptors (mostly ion channels) are not limited to a range of frequency — they can pick up a very wide range of frequencies (if you are typing in a laptop, you can feel the whirr of the disk through your wrists).

Ears

In the ear, there has been an additional development: the vibration receptor has been coupled with an amplifier (the tympanic membrane and bones of middle ear) plus a very high resolution Fourier transformer (the basilar membrane inside the cochlea). The whole contraption splits frequencies and sends the data to the brain to generate the feeling of 'audible' sound. However, the basilar membrane has a range of 20–20000 Hz (at birth; the range shrinks with age).

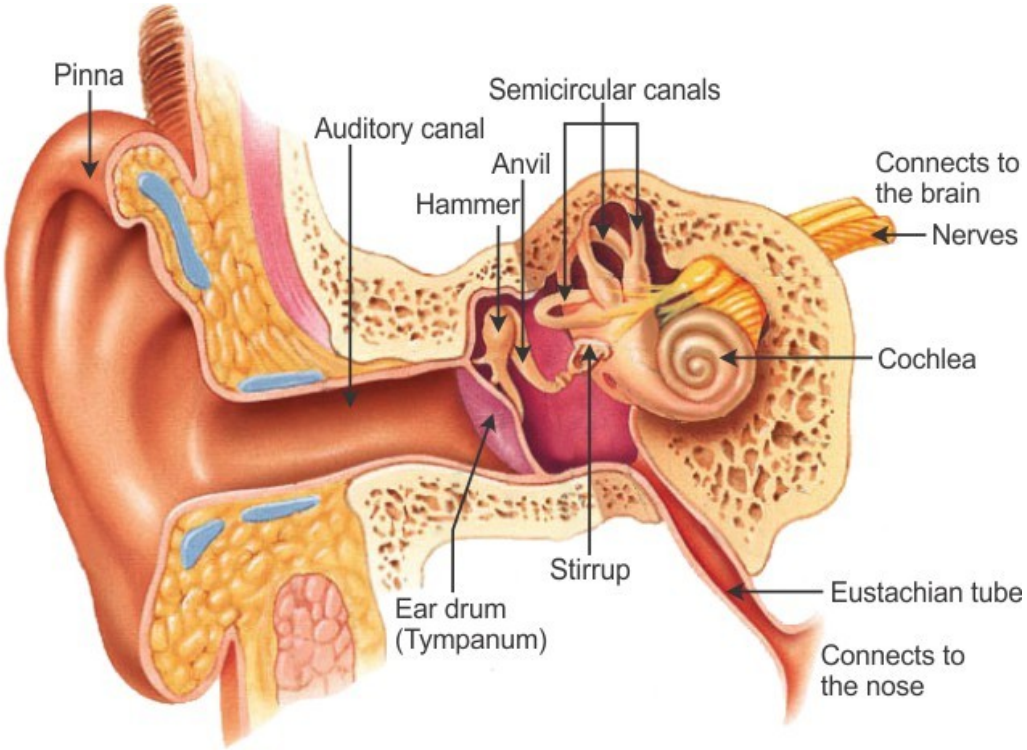

Illustration 2: Anatomy of the ear

As long as one is listening to music right at its source (i.e. sitting right in front of the instrument/ singer), the mechanism works fine. You get sounds of all frequencies and amplitudes absorbed throughout your body (similar to sitting inside a car with speakers on). However, the very moment sound is converted to electrical

signals, most of the information content is lost; amplifiers/ converters are biased towards the ear and will exclude all other frequencies other than those which are audible. Further, the ear can not distinguish between really close frequencies, say 310 and 312 Hz. It makes sense for converters to preserve only a few select frequencies of the spectrum, and throw the rest away, without compromising on what is 'audible'. The loss is palpable; there is almost a 20 fold reduction in size from lossless (PCM, AIFF, FLAC) to lossy (MP3, OGG) formats. The difference, of course is not noticeable to the ear (unless you are a trained audiophile); it is yet to be studied whether vibration receptors elsewhere in the body can make out the difference.

Gut

Going by the sheer numbers of neurons, the gastrointestinal tract (from the mouth to the.. erm.. the other end) can rightfully claim to be a 'mini brain' of sorts. The vibration receptors in the gut have been studied in detail, except regarding effects of music (a controlled study would be impossibly hard to design).
But there is a noticeable difference between how Indian instruments are played, in contrast to their western counterparts, and the difference may be attributed to vibration receptors in the gut. All string instruments are held tightly adherent to ones abdomen, so one 'listens' with his gut as he plays along. What effect this has on the gastro intestinal tract is difficult to predict. (Warning to the reader: there has been lot of pseudo science going on regarding 'therapy' with Indian music. Any 'therapy' must pass the litmus test of a randomised controlled trial. Its all or none.)

The role of the listener

The driving force of the development of music, across cultures, has been the listeners. Usually, the relationship is inverse: more the number of listeners, slower the development of music, even stagnation. The reason is easy to follow.

Before the advent of electronic music and fast modes of transport, a performer could have only a few select listeners (usually a bunch of aristocrats or a monarch). To sustain as a musician, (s)he was to entertain the same audience over and over again, every day, throughout her career. Repetition was not an option. She had to invent something new every day. Early exponents of Indian music could neither afford a wider audience, nor could they go on a world tour repeating the same performance across stages.

Nowadays, someone can produce one good song in a decade and make a career out of it, performing it over and over, in stages small and large, across cities and nations. With a constantly changing audience, the impetus for evolution of music is removed, and things stagnate.

Most of the theory now behind us, we can now move into individual rāgas.

Sārang

I planned to start with Bhupālí, but then it rained today. So Sārang, then.

It's better to start with a prototype; the song 'Ghoomar' from the movie 'Padmavat' uses the notes of Sārang in the appropriate order (although does not quite capture the mood). The combination

S R M P N S^

and

S^ n P M R S

is canonically known as *Vrindavani Sārang* (and I suggest you try it out now). Note the predominance of *re* and *pā*, and the *komal ni* during the descent. (There are is a faster, livelier variant of the same mood, *Megh Mallār*). The lack of dhā and gā gives Sārang a quite distinct tone.

How to describe this mood? In canonical texts, one is instructed to play Sārang only in a summer morning. I dissent. Listen closely to the combination in a string instrument or airpipe (a Harmonium would do)

S M P

And I am immediately reminded of gentle drizzles, the aftermath of a shower, the wet grass, droplets dribbling from the foliage. I am not alone; Sārang seems to incite similar feelings in lot many people. The Lata Mangeshkar — Dimple Kapadia combo *Jhuti Mooti Mitwa Awan Bole* – from the movie *Rudaali,* resonates with me nicely (the rain in the scene is a little too intense for Sārang, but I am willing to overlook that wee bit)

Sarang is one atypical member of the thāt *Kāfi*, for the fact that there is no gā, and the komal ni is touched only by a whisker, while descending. (The Kāfi thāt is defined by komal gā and komal ni). Like all moods, Sārang changes its texture depending on the tempo; this song by Pratima Bandyopadhyay is as close to a full classical rendition as one gets: '*Ningariya neel shari srimati chale*' -নিঙ্গারিয়া নীল শাড়ি শ্রীমতি চলে , from the Bengali movie *Dhuli.*

Analytic methods

In a discussion of music, we can never leave maths too far behind. Which means, we need techniques to analyse — and visualise — sound.

For electronic music, this is easy. Lossless files (WAV) are stored as a sequence of numbers, which reflect the very waveform. For example, when I say 'sā' at my microphone and save it as a WAV file, it gets stored like this

```
import matplotlib.pyplot as plt
from scipy.fftpack import fft
from scipy.io import wavfile
bitrate, data = wavfile.read('sā.wav') # load the data
print(data)

# Output
array([[184,   0],
       [138,   0],
       [186,   0],
       ...,
       [730,  -1],
       [673,   0],
       [710,   0]], dtype=int16)
```

When plotted directly, this data gives the bare waveform

```
a = data.T[0] # Selecting the first channel, remember these days all audio is stereo, i.e. two separate channels
plt.plot(a{:1000]) # Plotting the first 1000 values for easy visualisation
```

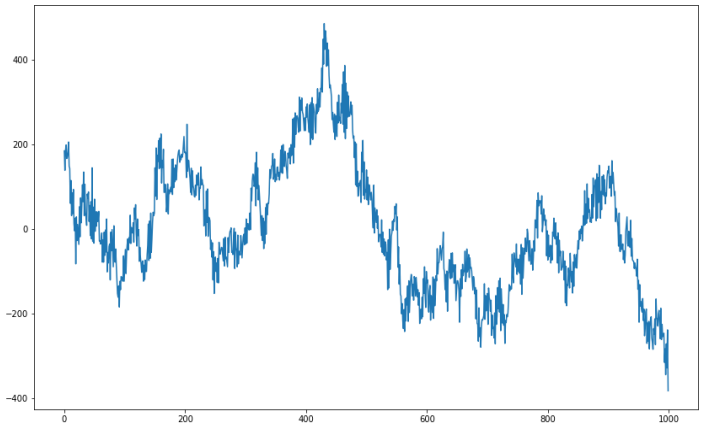

Illustration 3: The bare waveform of a 'sā' in my voice (amplitude plotted against time)

As you can see, I am not producing pure tone (actually, far from it). I am producing a random mix of frquencies. To break it down, we will use a Fast Fourier Transform[1]

1 Code snippet from user eusoubrasileiro at https://stackoverflow.com/questions/23377665/python-scipy-fft-wav-files

```
import matplotlib.pyplot as plt
from scipy.fftpack import fft
from scipy.io import wavfile
bitrate, data = wavfile.read('sā.wav')
datafft = fft(data.T[0])
length = int(len(datafft)/2)
plt.xlabel("Frequency")
plt.ylabel("Amplitude")
plt.plot(abs(datafft[:(length-1)]),'r')
plt.show()
```

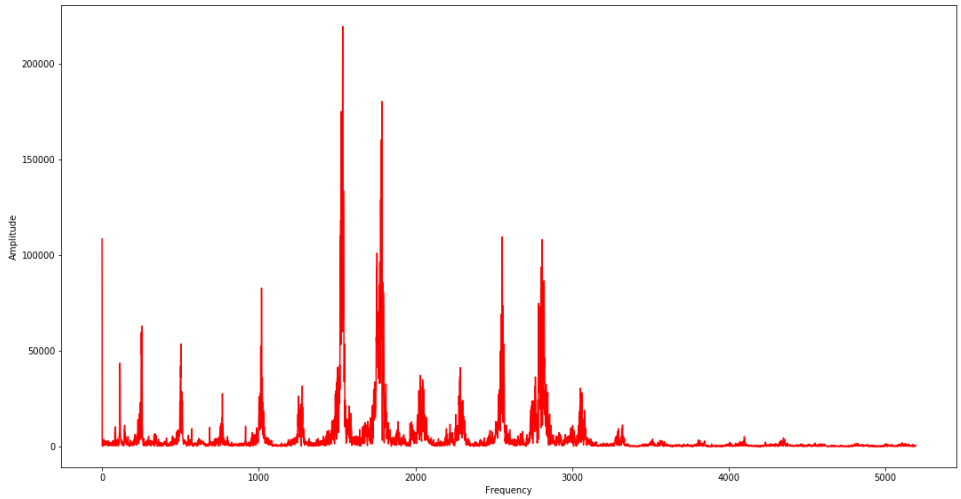

Illustration 4: The D# (sa) from my voice

My ‘sā’ is a lot many frequencies. most prominently those between 1000–2000 Hz. This is not very useful: let’s try it out with a piano.

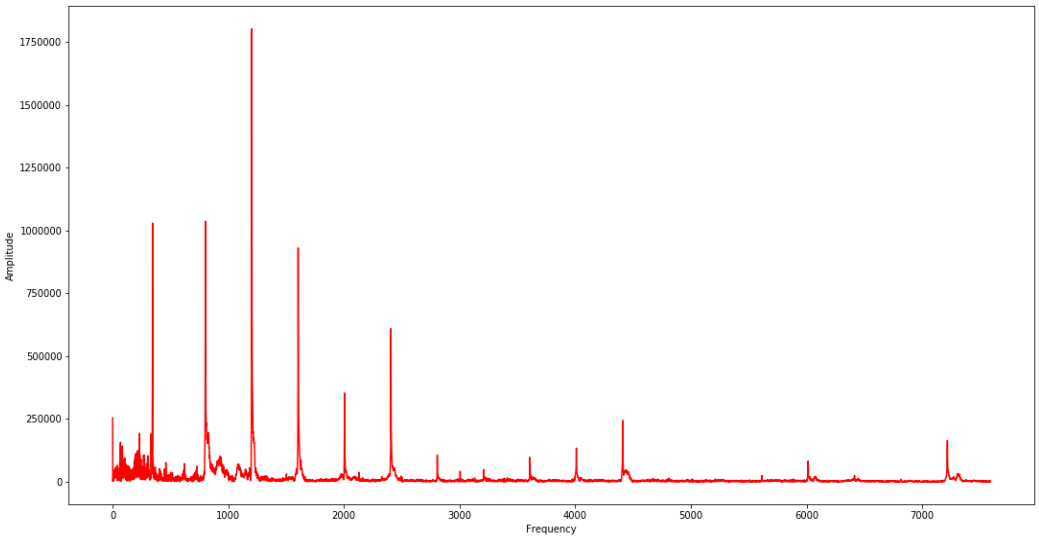

Illustration 5: The Fourier transform of a D# from a piano

As expected, the piano produces a much cleaner graph (pardon the ambient noise at my home, which are showing up as the low frequencies). The Fourier transform produces nice frequency graphs, which will be handy for our purpose.

Visualising all at once

Any sound, in effect, is a set of frequencies, having certain amplitudes, which change with time. We can, theoretically, make a 3 dimensional plot of all three variables.[2]

2 Wavosaur has built in 3D spectrograms: https://www.wavosaur.com/download.php

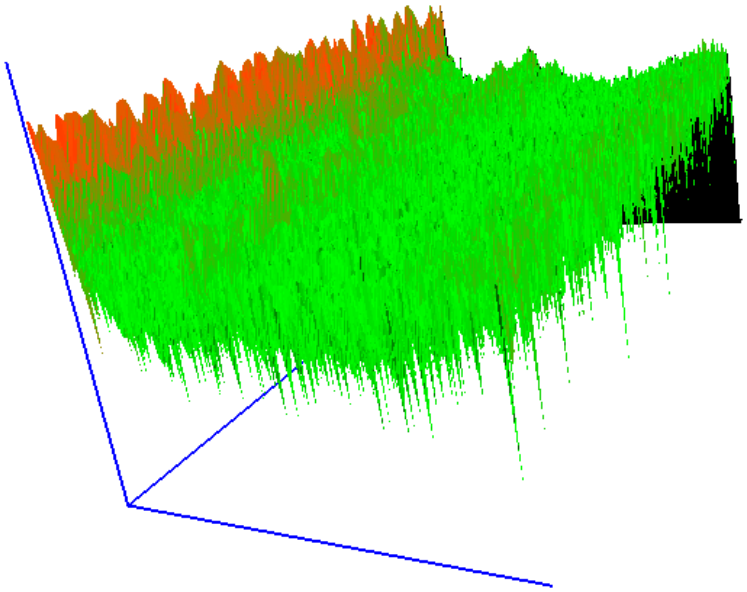

Illustration 6: x = time, y = frequency, z = amplitude

Alternatively we can represent the 3rd dimension with intensities of color (brighter = louder) and convert any sound (of a certain duration) into an image![3]

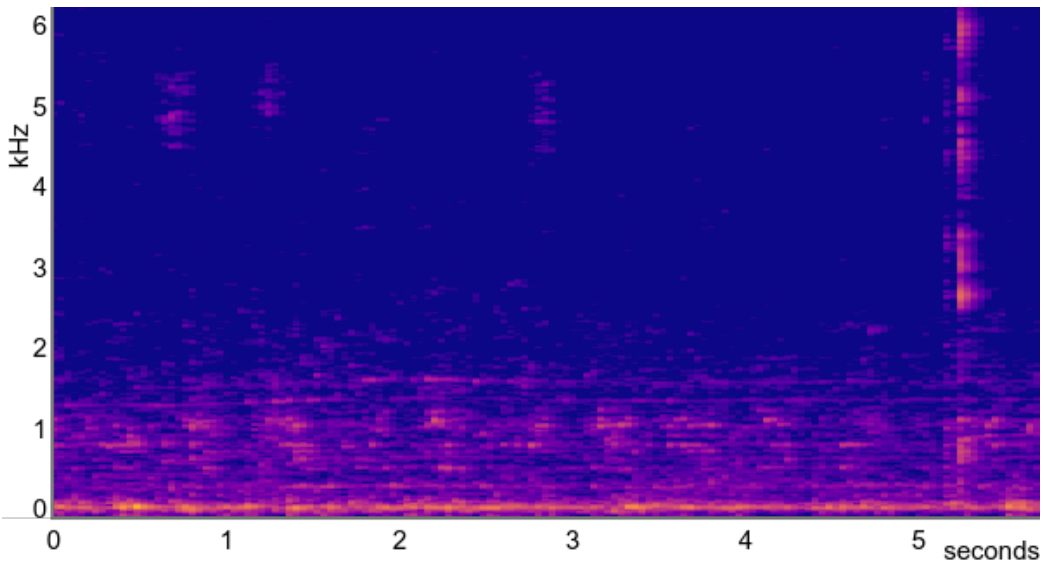

Illustration 7: The plot of ambient sound in my room

3 Try it out at https://auditoryneuroscience.com/acoustics/spectrogram.

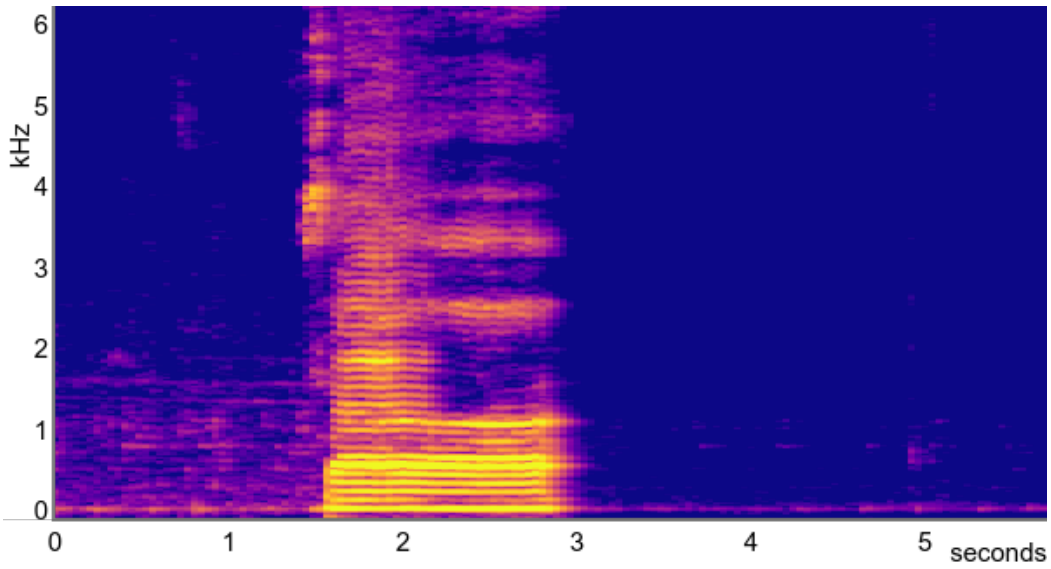

Illustration 8: And what happens when I say 'sā'

Jaunpurí

One of the most confounding facts about Indian music is that the same combination of notes may convey entirely different moods, depending on the way they are served. For example, the notes

S R g M P d n S^

Are common to a lot many rāgas; in fact, the combination of komal gā, komal dhā & komal ni defines a thāt, *Aśavrí*.

Minor scales and Aśavrí

Incidentally, this is the same combination of notes

C D D# F G G# A# C^

that's known as the C natural minor scale in Western music; a very common variant of the minor scale, the *harmonic* minor

C D D# F G G# B C^

translates to

S R g M P d N S^

only the *ni* has changed, from *komal* to *shuddha ni*; this has no equivalent thāt, although individual rāgas may use it. In similar vein, the melodic minor

S R g M P D N S^

(i.e. only a komal gā) has no Indian equivalent thāt.

The movement of Darbari and Jaunpurí

Here's the ascent and descent in rāga Darbari, (which is quite grave): https://youtu.be/vj-HTVssKQA/

S R g M P d n S^

S^ d n P M P g M R S

The characteristic motif in Darbari is the hop during descent: S d n P, instead of S n d P (and also, unlike Jaunpurí, there is a *komal* ni during ascent). This little tweak imparts a profoundly sombre mood to the rāga. Add to the fact that Darbari usually spends more time in the lower half of the octave.

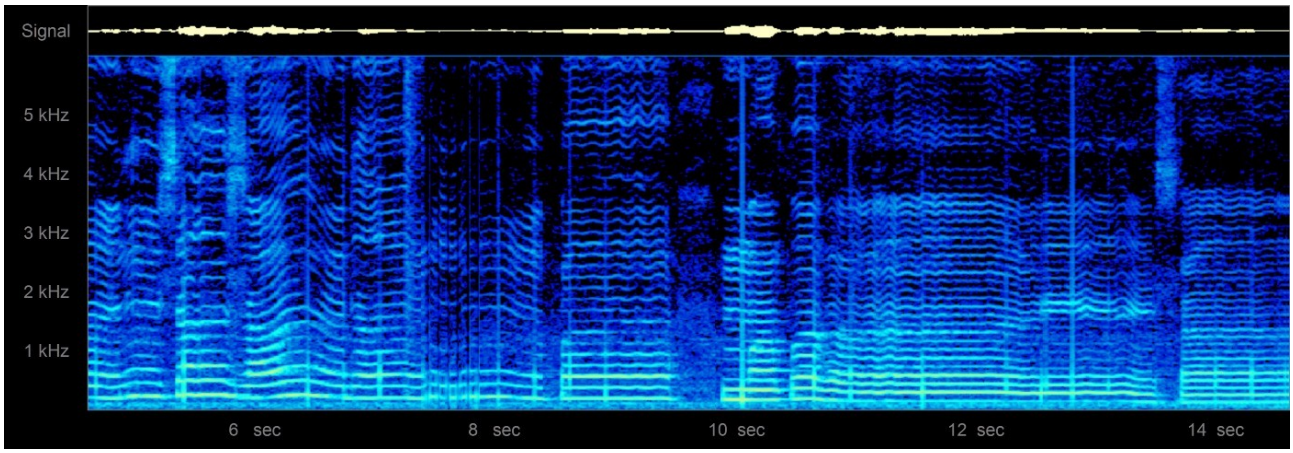

Illustration 9: The way Darbari is played, things tend to gravitate towards lower frequencies

Whereas, the mood of Jaunpurí, although using the same notes, is solemn and sacrificial; the ascent-descent routine produces a different spectrogram altogether.

There is no komal ni to glide over during the ascent, the notes jump from komal dhā directly to sā^. (Can you see it in the spectrogram)

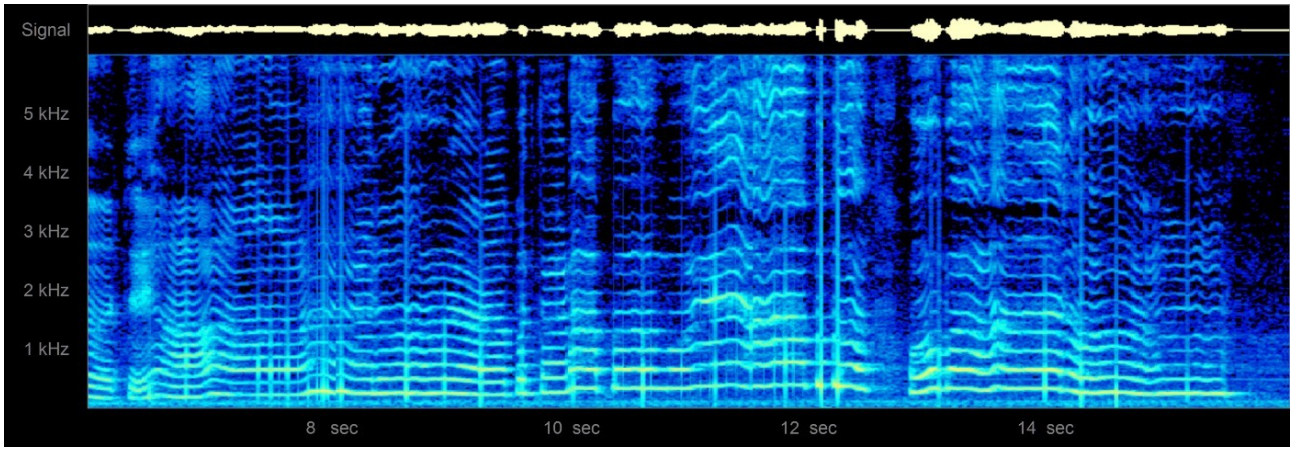

Illustration 10: A visible jump between low and higher end of the octaves

This little tweak also alters the time these two rāgas ought to be played: Jaunpurí in midmorning, Darabari at midnight. Jaunpurí moves with quick jumps between notes, often skipping 3–4 notes in between.

The canonical example of Jaunpurí is a quite well known Bhajan, which has been remade numerous times ('Prabhu Mohe Bharosa ek Tiharo' by Ajay Chakrabarty). In fact, the next canonical example would be the same song remade into Bengali, by Nazrul ('*Mama madhur minati shuno ghanasyam bihari*').

The Aśavrí thāt has only a select set of rāgas, which are not very dissimilar from each other in notation, but each imparts a very specific mood. I find Jaunpurí overtly sombre, often to the point of being shrill, in its devotional avatar. Darbari is a little self obsessed in its celebration of despair. And there's *Adānā* (ara-na), oh the out-of-this-world cosmic feel of Adānā! However, the same notes can be rearranged to produce quite different results, although the framework of the thāt has to be bent ever so slightly, like using shuddha ni (N) . Apart from such minor departures, Aśavrí fits several western compositions nicely.

Adānā

Adānā? আড়ানা? I prefer calling it Arana because that's how I would pronounce it. And also because it exemplifies the fact that in spite of the abstract, theoretical interchangeability of their constituent notes, rāgas can be as different as oil and water.

If you hadn't noticed, I am still continuing with the Aśavrí thāt, which is roughly equivalent to a minor scale of Western music. Arana follows suite and ascends like

S R g M P N P S^

the descent is very similar to Darbari

S^ d n P M g R S

But by the very nature in which it is presented, nothing sounds remotely close to Darbari. Whereas Darbari has a grave, aged feel (partly because of the fact that it tends to stay in lower and lower-half of middle ocatve), Arana has a boundless, almost cosmic feel to it. The reason might be that Arana operates on the higher end of the octave, and is relatively staccato in nature, with simple, deft movements. Example - A *Rabindrasangeet* in Arana: "Your words traverse through space-time" (Rabindranath Thakur - 'Bani taba dhay gagane gagane')

The astronomical feel of Arana is compounded by the time for the rāga: midnight, 12–3 am. The devotional *shyamasangeet* 'He chamunde' by Ajay Chakrabarty captures the laser-like, high to shrill, always restless, perpetually accelerating, notes of Arana.

Conversion chart

I have mentioned in prelude that the system of notation of Indian music is *relative,* c.f. the absolute system of Western music. It turns out, this is a matter of great convenience when writing down music: the notation of Indian music

is *considerably* simpler. There is no staff to memorise, no triads to mug up and no seventh chords to gloss over.

To begin with, we must choose a ‘sā’, the root of all tunes. Supposing we choose middle C (about 260 Hz) as tonic (or ‘sā’), then it follows

C C# D D# E F F# G G# A A# B

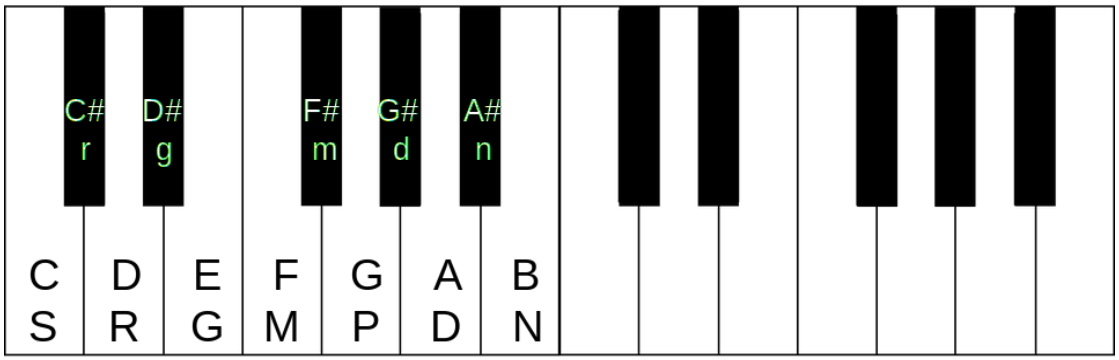

Illustration 11: If we choose ‘C’ as the tonic (‘sā’), the rest fall into place

is exactly equivalent to

S r R g G M m P d D n N S^

However, ‘sā’ is not a fixed note; we can pick any arbitrary key as ‘sā’, and things would still work the way expected

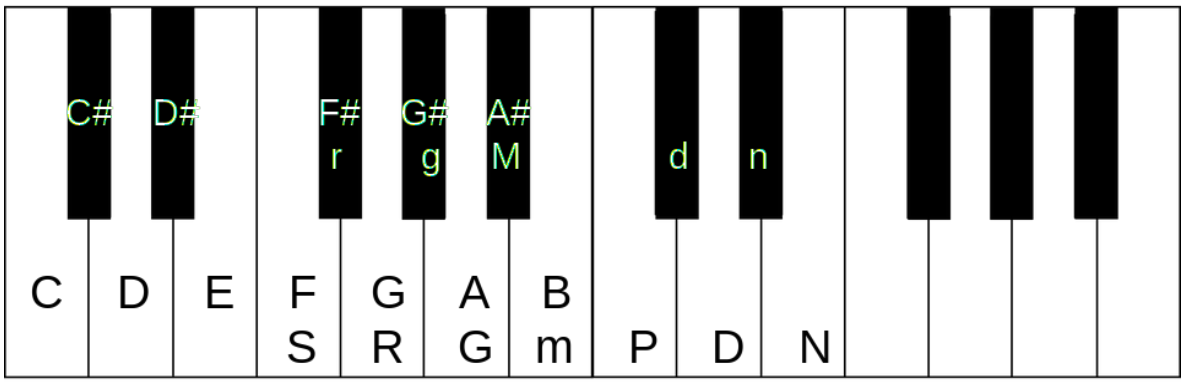

Illustration 12: Choosing F as 'sā' hardly makes a difference

This little detail out of our way, we can now formulate a most convenient conversion chart

Scales

How to divide an octave differs between cultures;

1. the **pentatonic** (divide an octave in 5 notes) is the oldest, and many different primitive cultures across continents have come up with it independently; it is usually spelt as S R G P D S^; this is exactly the notes of the rāga *Bhūpālí*. The pentatonic is found as a base system in all genres of music, and is also the easiest to play (just go on tapping the black keys in a piano). The scale can be tweaked to any degree: the ***natural minor* pentatonic** scale translates as S g M d n S^ (Mālkośh) or S R g P d S^, the ***harmonic minor pentatonic*** is S g M d N S^, and the ***melodic minor pentatonic*** is S R g P D S^ (akin to 'Śivranjani') or S g M D N S^
2. the **major heptatonic scale** (7 notes per octave) is the usual S R G M P D N S^; the **natural minor** variant translates as S R g M P d n S^ (i.e. the *Aśavrí* thāt); the **harmonic minor** is simply S R g M P d N S^, and **melodic minor** is S R g M P D N S^

3. **chromatic** (i.e. 12 notes per octave) is the familar 12 notes S r R g G M m P d D n N S^; note that by the very nature pianos are tuned, any consecutive 12 keys in a piano would follow this relation (well, not exactly, but close enough)
4. Indian music further divides an octave in 22 notes, which can be produced only by specialised instruments (and of course, human voice)

Intervals

There is, strictly speaking, no well defined concept of an *interval* in Indian music; however, one may wish to give the 12 notes fancy names (an 'augmented second' sounds more impressive than just D# or 'komal gā')

1. minor second, semitone= S r
2. major second, diminished third = S R
3. minor third, augmented second = S g
4. major third, diminished fourth = S G
5. perfect fourth, augmented third = S M
6. diminished fifth, augmented fourth, tritone = S m
7. perfect fifth, diminished sixth = S P
8. minor sixth, augmented fifth = S d
9. major sixth, diminished seventh = S D
10. minor seventh, augmented sixth = S n
11. major seventh, diminished octave = S N
12. perfect octave = S S^

Triads

Because of the mostly free flowing nature of Indian music, there is no fixed system of triads either; the combination of notes in triads may be written as follows

1. major triad = S G P
2. minor triad = S g P
3. diminished triad = S g m
4. augmented triad = S G d

Seventh chords

The combination of four notes is also quite uncommon in Indian music, a few of them touch a few notes of select rāgas, but overall, rāgas do not move in such quartets.

1. major major seventh = S G P N
2. major minor seventh, dominant seventh= S G P n (superficially resembling *Khambaj* thāt)
3. minor minor seventh = S g P n (resembles the notes of *Kaafi* thāt)
4. half diminished seventh = S g m n
5. fully diminished seventh = S g m D

Although the conversion has no relevance to Indian music, Western audiences may find a degree of familiarity in knowing that the building blocks of Western music have their Indian equivalents.

Bhūpālí & Mālkośh

I mention two rāgas, which are as distinct as water and fire, in the same breath — which kind of proves the point that inspite of their abstract, theoretical interchangeability of notes, rāgas can be acutely different.

If you have a piano and you start from the middle C, Bhūpālí plays out as

S R G P D S^

Which will be identifiable as the major pentatonic scale (and *Mohanam* in Carnatic music)

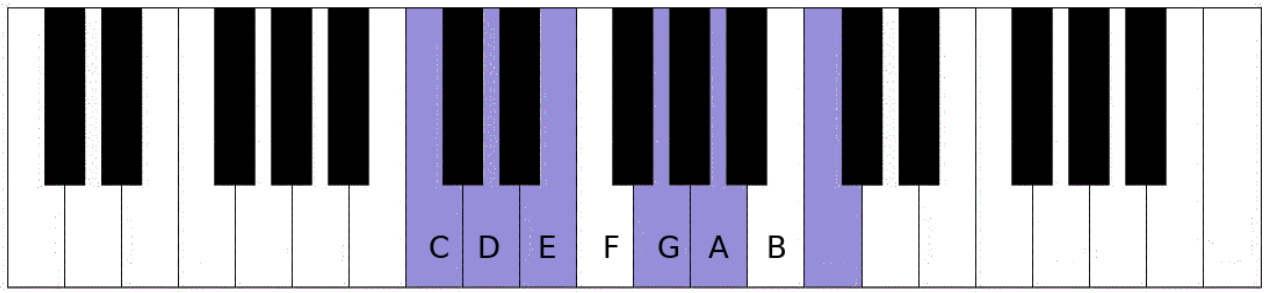

Illustration 13: The simplest of all, five notes of Bhūpālí

However, if you're trying to play Bhūpālí without even having to look at the piano, there's a shortcut:

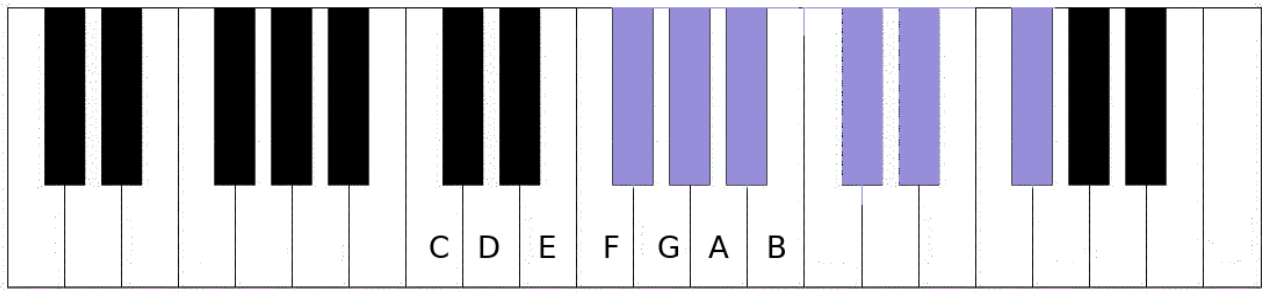

Illustration 14: Do you see it?

If you start from F#, the successive black keys in the standard piano will be the very notes of Bhūpālí. In fact, Bhūpālí represents the primordial five divisions of an octave, which many cultures, including ours, have developed independently.

Now, on the surface, Mālkośh (*Malkauns?)* is nothing remotely similar. Whereas, Bhūpālí has all *shuddha* notes, Mālkośh belongs to the *Bhairavi* thāt with no less than *three* komal notes

S g M d n S^

(The equivalent rāga in Carnatic music is *Hindolam*). But putting things in perspective, here's Mālkośh for you beginning from A#

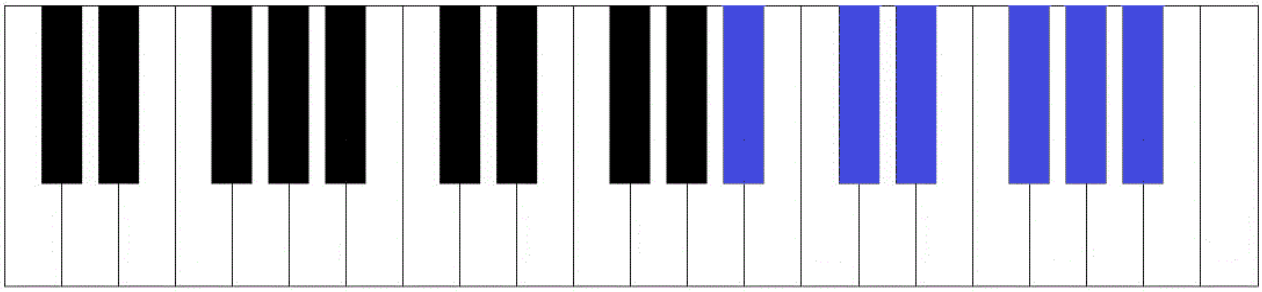

Illustration 15: It seems Mālkośh uses the same notes as Bhūpālí, in a different order

Which is to say, if you keep moving over the black keys of a piano, you will either be playing Mālkośh or Bhūpālí (or gibberish, but let's stick to the plan here). How on earth can the same set of keys play two different rāgas?

Among other things, this proves, quite conclusively I suppose, that the exact same set of frequencies (literally, the same) can produce entirely different moods depending on minor rearrangements in sequence. For example, Bhūpālí moves about deftly, with emphasis on G and D.

Ascent: S R **G** P **D** S^

Descent: S^‿ **D** P ‿ **G** R S

The character '‿' indicates a *meer,* which is a slow, roundabout way of moving from a note to another, touching numerous frequencies in between. A typical movement in Bhūpālí would sound like

G R S R G P D S^ D P G R S D` S

(the ‘`’ indicates lower octave). The movements do not stop for anything in between, there are no philosophic pauses or complicated acrobatics between notes, making Bhūpālí a favorite for beginners. This song brushes through the notes of Bhūpālí, lazying through some of its typical movements - ‘*Dil hum hum karein*’ by Lata Mangeshkar.

Mālkośh, on the other hand, has got *senior* written all over it. It’s grave, slow, hesitant in its movements, and sometimes, twisted like a rheumatic finger.

Ascent: n` S g **M** d n **S**^

Descent: **S**^ n d **M** g M g S

Whereas Mālkośh is a midnight rāga, Bhūpālí belongs to the evening. Mālkośh spends most of its time in the lowest octave, spanning hours of *vistāras* in the leftmost parts of the Harmonium. Bhūpālí, however, has no such indulgences and is typically sung in short *khayals*. The two rāgas are kind of Siamese twins, separated only by the distance of a D# from an A#. For canonical Mālkośh, listen to a very well known Bhajan by Ajay Chakrabarty / Bhimsen Joshi (‘*Mandar Dekh Dare Sudama*’).

Śivranjani

Once you begin to mix and match notes, there’s really no end to it. Pick any 5 from 12 notes, and you’ll get a pentatonic. Of course, you might choose

S R G P D S^

which is simply, Bhūpālí (or Mohanam in Carnatic), and a subset of the *natural major heptatonic* scale S R G M P D N S^.

But when you delve into minors, you have several choices; the *natural minor hepatonic* is

S R g M P d n S^

You can subset this into pentatonic in several different manners. The one similar to Bhūpālí would be

S R g P D S^

Let's call this '**natural minor pentatonic**'; of course, a similar set

S g M d n S^

(which is Mālkośh) will also make the claim. Things get complicated when you use subsets of the ***harmonic minor heptatonic***

S R g M P d N S^

Which in pentatonic might be split into

S g M d N S^

or even

S R g P d S^

Converting the last one into ***melodic*** minor pentatonic, we get

S R g P D S^

This is 'Śivranjani', a go-to rāga for many composers. However, unlike the melodic minor, Śivranjani descends with a *shuddha D* and *not* a komal one. The one change from Bhūpālí, the inclusion of a *komal* gā, makes Śivranjani a pang of agony (i.e. '*Mere Nayna Sawan Bhaa do*' by Kishore Kumar).

Its been abused as a tear-jerker whenever situation demanded (i.e. 'Jaana kahan gaye who din' by Mukesh).

Because of the *komal* gā, Śivranjani belongs to the 'Kaafi' *thāt* and is to be sung at midnight; a sense of impending dread, hopelessness and a hint of supernatural pervades this magnificient song ('Kahin deep jale kahi dil') by Lata Mangeshkar (makes for a perfect Halloween evening).

Modes

Once we have glossed over the bare rudiments of few rāgas, it is now time we review the musical 'modes' and look for their evolutionary counterparts.

'Modes' are roughly equivalent to 'thāt's of Indian classical music, in the sense that they are all heptatonic, with a combination of *shuddha* and *komal* notes, although the Western notation doesn't often clarify this point. The 'modes' have been handed over from Greeks, which reflects in their names (Ionia, Lydia, Doria are all Greek provinces), but have been significantly altered in the middle ages to snuggly fit the piano.

> "The musical modes differ essentially from one another, and those who hear them are differently affected by each. Some of them make men sad and grave, like the so called Mixolydian; others enfeeble the mind, like the relaxed modes; another, again, produces a moderate or settled temper, which appears to be the peculiar effect of the Dorian; and the Phrygian inspires enthusiasm."
>
> 'Politics', Aristotle

'Modes' can be played on a piano quite easily, with all consecutive white keys, provided you start from the right place. For example, the Ionian mode starts from C, and continues on with the white keys

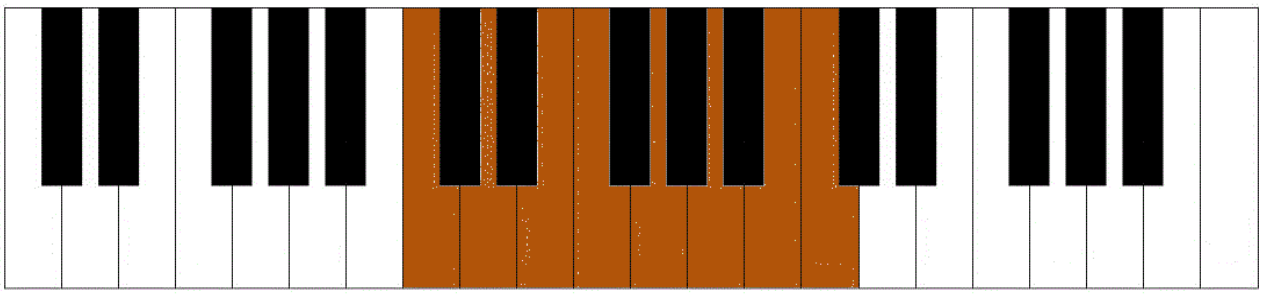

Illustration 16: The Ionian mode played from 'C'...

To play the Dorian mode from 'C' you need to juggle through white and black; however, if you choose 'D' as starting point, it's all white keys again

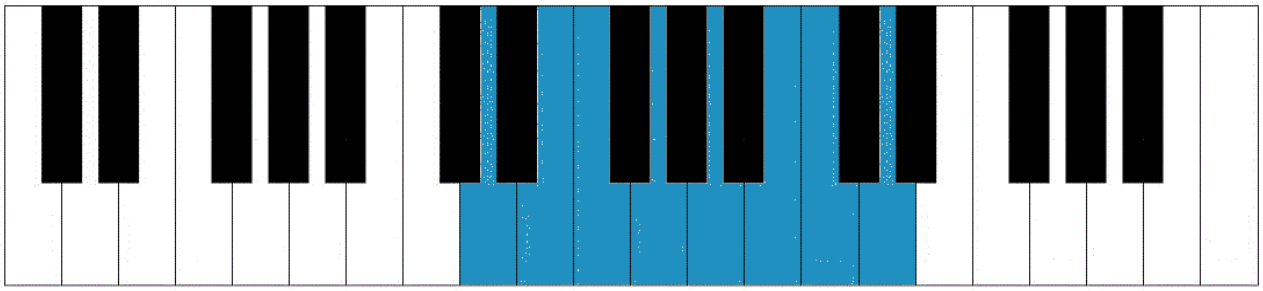

Illustration 17: … is as easy as Dorian mode played from 'D'

Ionian mode

The combination

C D E F G A B

or, simply

S R G M P D N S^

Is the Ionian mode, also called the *Bilawal* thāt. It is all *shuddha* notes up and down, and is the canonical *natural major scale.*

Dorian mode

D E F G A B C

or

S R g M P D n S^

is the 'Kaafi' thāt, and *almost* similar to the *natural minor scale*, except that the 'dhā' is *shuddha.*

Phrygian mode

E F G A B C D

is the same as

S r g M P d n S^

This is just *Bhairavi* thāt, which is also very similar to the *natural minor scale* except that 'Re' is *komal.*

Lydian mode

F G A B C D E

or

S R G m P D N S^

The inclusion of the *teevra* 'mā' (also called the tritone/ augmented 4th) makes this the *Kalyaan* thāt, making it ever slightly different from natural major scale/ Bilawal/ Ionian.

Mixolydian mode

G A B C D E F

or

S R G M P D n S

The single *komal* 'Ni' (minor seventh) gives this a delicate flavour, the same as *Khambaaj* thāt.

Aeolian mode

A B C D E F G

or

S R g M P d n S^

is just the natural minor scale, or *Aśavrí* thāt.

Locrian mode

This is an oddball

B C D E F G A

or

S r g M m d n S

It has all *komal* Re, gā, dhā, Ni and both *shuddha* and *teevra* mā (diminished fifth/ augmented 4th). The use of consecutive half notes (shuddha 'M' and teevra 'm') has no Indian equivalents thaats (but individual rāgaas may use it).

You can explore the modes at https://learningmusic.ableton.com/advanced-topics/modes.html. Modes represent no particular rāga, but a *thāt*, which is a framework for composing rāgas. I'll make recurring use of modes in forthcoming essays.

Bhairav

How can something be fresh, innocent, inspring, yet grave and sombre? Bhairav has always been a paradox to me. It sounds so *scary* at times, with its emphasis on *komal re*. Yet, it's a morning rāga. It's *the* morning rāga, supposed to be played in and around the time of sunrise.

The Bhairav *thāt* moves as follows

S *r* G M P **d** N S^

S^ N d P M G, r P M G *r,* S

Note the prolonged stays in *komal re* and *komal dhā*. Combined with the time it is supposed to be sung, Bhairav creates an ambience of introspection, bordering on fear. However, Indian rāgas simply refuse to be pigeonholed into a particular stereotype. If you are looking for positive vibes, sit with a Tanpura at daybreak, and just harp the notes over and over.

But here's the thing: like all Indian rāgas, Bhairav has multiple personalities. It can inspire feelings of desperation and melancholy equally well. This song ('Mohe bhool gaye saawariya') by the legendary Lata Mangeshkar incites outright dread.

Bhairav is malleable, and can be put to great use by well endowed vocalists. This famous dance-floor scorcher by Sukhwinder Singh ('Dard-e-disco') never makes you, or *lets* you, think of morning (on the contrary, the song seems made for all-nighter parties).

Bhairav is subtly present in 'Tanhayee' by Sonu Nigam, where he squeezes out the pain in Bhairav (although, the *komal ni* is typical of Ahir Bhairav).

One variant of Bhairav , the *Ahir* Bhairav (the one with the *komal ni* and without the komal dhā) is an insanely popular choice for composers. We'll talk about it in the next tranche.

One last thing...

It would do great injustice to Indian music if I close without mentioning the four strata of sound. The kind of sound that is audible with our ears is just *one* of four. Indian music operates on three more layers of sound.

Of the many offshoots of the Vedas, the *Pancarātra*, or the philosophy of the *Vaiśńaba* sect is one of the oldest (dating back to at least 2nd century BC[4]). While most of the *Pancarātra* text is a detailed description of worship and rituals, the treatise spends a considerable amount on the various stages of the word.

> ... (spoken) letters which pass through the stages called *Para*, *Paśyantí*, *Madhyamā* and *Vaikhari*. Para is the first stage in which sound which is partless lies in the *Mulādhāra* below the navel. It is not audible. *Paśyantí* is the next stage which is in the navel where *Para* takes its places. This does not admit of any transaction and could be known by the *yogins*. At this stage, sound undergoes change as *Prakrti* and *Pratyaya* (suffix). The third stage is called *Madhyamā* which occupies the heart. Here the sound

4 Dasgupta S. History of Indian Philosophy. Kokata (Rupa) 2018. Vol II:299

is not knowable to others. The last stage is called *Vaikhari* which occupies the throat. This is audible.[5]

— *Iśvara Samhitā*

Later, this viewpoint was reinforced by Bhartṛhari in 5th century AD in his treatise on Grammar; however, Bhartṛhari's main focus was on the *sphota* (unit of language) and he mentions the stages of the word only in passing.

वैखर्या मध्यमायाश्च पश्यन्त्यश्च इतद अद्भुतम्

- Bhartṛhari, Vākyapadīya:I.143

Put simply, the sounds that you can hear and feel with your ears, the kind of sound we have been talking about throughout this book, are all *Vaikhari*; whereas the 'sound' of your thoughts (you can *listen* to yourself thinking, right?) is an entirely different entity, *Madhyamā.*

Let's just keep that on the back of your mind, for now.

5 Varadachari V Tripathi GC. Iśvara Samhitā Vol I. New Delhi (Indira Gandhi National Centre for the Arts):218