The Practical Sanskrit-English Dictionary by Vaman Shivram Apte and The Graphical Law

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Abstract

We study the words of the dictionary, the Practical Sanskrit-English Dictionary by Vaman Shivram Apte, the second reprint edition. We draw the natural logarithm of the number of words, normalised, starting with a letter vs the natural logarithm of the rank of the letter, normalised. We conclude that the dictionary can be characterised by BW(c=0.01), the magnetisation curve of the Ising Model in the Bragg-Williams approximation in the presence of external magnetic field, H. $c = \frac{H}{\gamma\epsilon} = 0.01$ with ϵ being the strength of coupling between two neighbouring spins in the Ising Model, γ representing the number of nearest neighbours of a spin, which very large.

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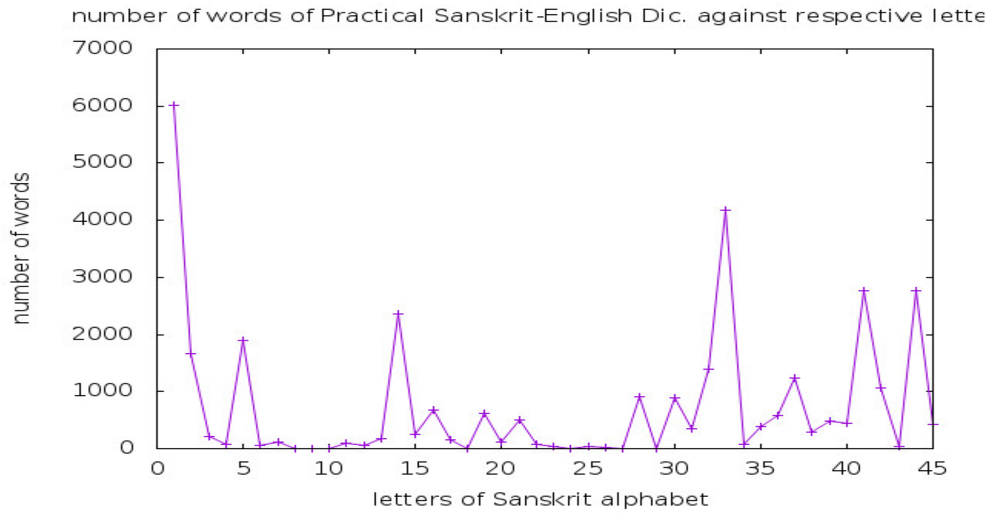

FIG. 1. The vertical axis is the number of words of the Practical Sanskrit-English Dictionary , [1]. The horizontal axis is the letters of the Sanskrit alphabet. Letters are represented by the sequence number in the alphabet as it appears in the dictionary, [1].

I. INTRODUCTION

"Ti, Tos, Anti,
Si, Thas, Tha.."

Lyrical hymns to poetical novels, from medium of teaching to description of epics, Sanskrit offers a matrix of rhythmic acoustical exchanges little bit evolved from songs; a marvel, a culmination in literary exercises two thousand years back. Here in this paper we take a dictionary of this language, the Practical Sanskrit-English Dictionary by Vaman Shivram Apte, the second reprint edition, [1].

We have counted the words of the The Practical Sanskrit-English Dictionary by Vaman Shivram Apte, the second reprint edition, [1], one by one. The result is the figure, fig.2, the table, tableI. To visualise we plot the number of words against the respective letters in the dictionary sequence,[1], in the adjoining figure, fig.1.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
6011	1669	204	83	1901	67	108	1	1	1	88	61	175	2353	249	678	151	2	617	123	510	70	44	4
25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45			
45	10	1	909	9	892	356	1384	4177	87	382	583	1247	297	490	454	2773	1070	37	2766	425			

TABLE I. Words of the Practical Sanskrit-English Dictionary by Vaman Shivram Apte: the odd rows represent letters of the Sanskrit alphabet, in the serial order, represented by their sequence number in the dictionary, [1], the even rows represent the numbers of corresponding words.

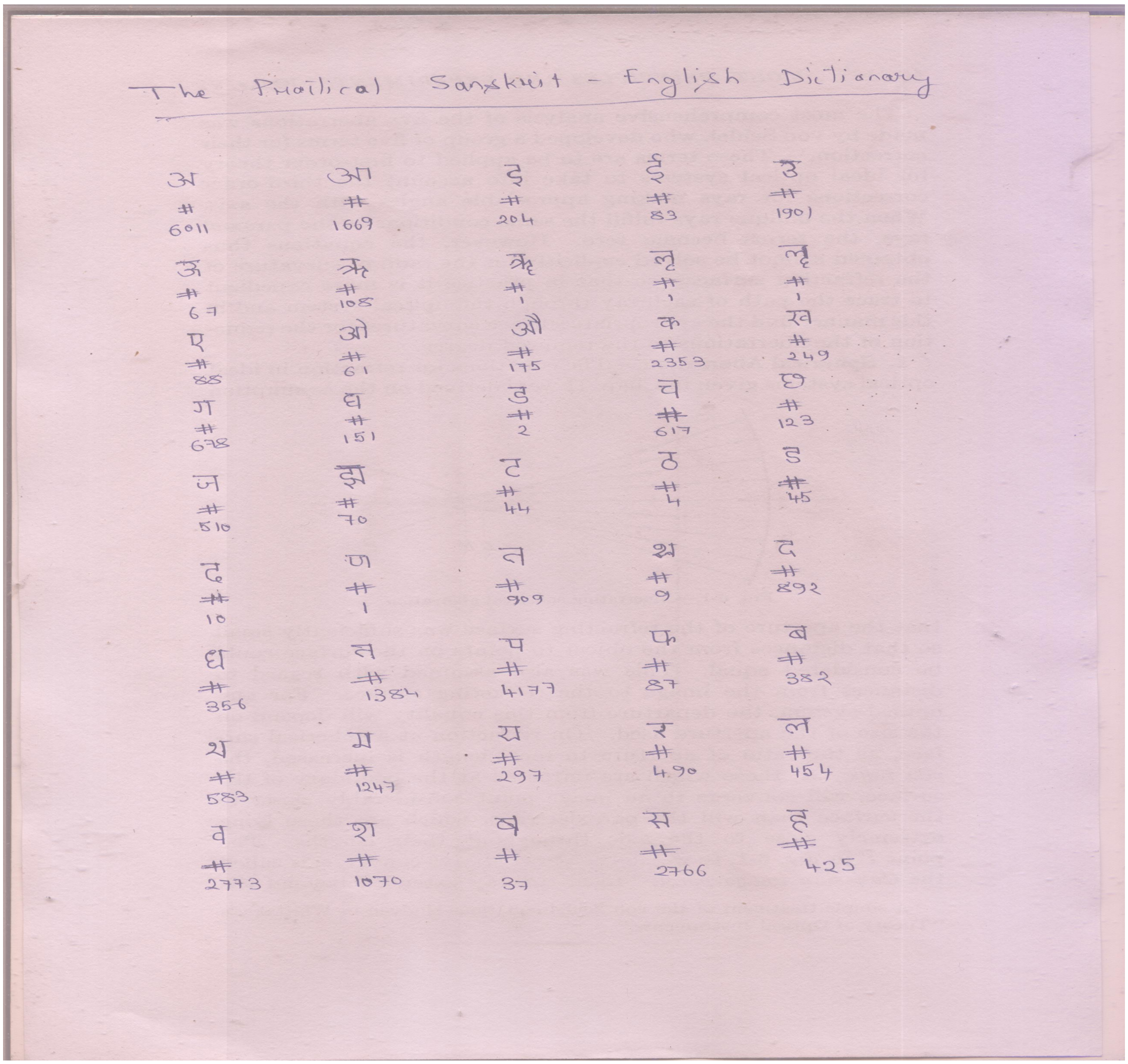

FIG. 2. Numbers of words starting with various letters of the Sanskrit alphabet

Next on to the Graphical Law, we proceed in the rest of the paper. We have started considering magnetic field pattern in [2], in the languages we converse with. We have studied there, a set of natural languages, [2] and have found existence of a magnetisation curve under each language. We have termed this phenomenon as the Graphical Law.

Then, we moved on to investigate into, [3], dictionaries of five disciplines of knowledge and found existence of a curve magnetisation under each discipline. This was followed by finding of the graphical law behind the bengali language,[4] and the basque language[5]. This was pursued by finding of the graphical law behind the Romanian language, [6], five more disciplines of knowledge, [7], Onsager core of Abor-Miri, Mising languages,[8], Onsager Core of Romanised Bengali language,[9], the graphical law behind the Little Oxford English Dictionary, [10], the Oxford Dictionary of Social Work and Social Care, [11], the Visayan-English Dictionary, [12], Garo to English School Dictionary, [13], Mursi-English-Amharic Dictionary, [14] and Names of Minor Planets, [15], A Dictionary of Tibetan and English, [16], Khasi English Dictionary, [17], Turkmen-English Dictionary, [18], Websters Universal Spanish-English Dictionary, [19], A Dictionary of Modern Italian, [20], Langenscheidt's German-English Dictionary, [21], Essential Dutch dictionary by G. Quist and D. Strik, [22], Swahili-English dictionary by C. W. Rechenbach, [23], Larousse Dictionnaire De Poche for the French, [24], the Onsager's solution behind the Arabic, [25], the graphical law behind Langenscheidt Taschenwörterbuch Deutsch-Englisch / Englisch-Deutsch, Völlige Neubearbeitung, [26], the graphical law behind the NTC's Hebrew and English Dictionary by Arie Comey and Naomi Tsur, [27], the graphical law behind the Oxford Dictionary Of Media and Communication, [28], the graphical law behind the Oxford Dictionary Of Mathematics, Penguin Dictionary Of Mathematics, [29], the Onsager's solution behind the Arabic Second part, [30], the graphical law behind the Penguin Dictionary Of Sociology, [31], behind the Concise Oxford Dictionary Of Politics, [32], a Dictionary Of Critical Theory by Ian Buchanan, [33], the Penguin Dictionary Of Economics, [34], the Concise Gojri-English Dictionary by Dr. Rafeeq Anjum, [35], A Dictionary of the Kachin Language by Rev.O.Hanson, [36], A Dictionary Of World History by Edmund Wright, [37], Ekagi-Dutch-English-Indonesian Dictionary by J. Steltenpool, [38], A Dictionary of Plant Sciences by Michael Allaby, [39], respectively. The graphical law was pursued more in Along the side of the Onsager's solution, the Ekagi language ,[40], Along the side of the Onsager's solution, the Ekagi language-Part Three, [41], Oxford Dictionary of Biology by Robert S. Hine and the Graphical law, [42], A Dictionary of the Mikir Language by G. D. Walker and the Graphical law, [43], A Dictionary of Zoology by Michael Allaby and the Graphical Law, [44], Dictionary of all Scriptures and Myths by G. A. Gaskell and the Graphical Law, [45], Dictionary of Culinary Terms by Philippe Pilibossian and the Graphical law, [46], A Greek and English Lexicon by H.G.Liddle et al simplified by Didier Fontaine and the Graphical law, [47], Learner's Mongol-English Dictionary and the Graphical law, [48], Complete Bulgarian-English Dictionary and the Graphical law, [49], A Dictionary of Sindhi Literature by Dr. Motilal Jotwani and the Graphical Law, [50], Penguin Dictionary of Physics, the Fourth Edition, by John Cullerne, and the Graphical law, [51], Oxford Dictionary of Chemistry, the seventh edition and the Graphical Law, [52], A Burmese-English Dictionary, Part I-Part V, by J. A. Stewart and C. W. Dunn et al, head entries and the Graphical Law, [53], The Graphical Law behind the head words of Dictionary Kannada and English written by W. Reeve, revised, corrected and enlarged by Daniel Sanderson, [54], Sanchayita and the Graphical Law, [55], Samsad Bangla Abhidan and The Graphical Law, [56], Bangiya Sabdakosh and The Graphical Law, [57], Samsad Bengali-English Dictionary and The Graphical Law, [58], Rudyard Kipling's Verse and the Graphical Law, [59], W. B. Yeats, The Poems and the Graphical Law, [60], The Penguin Encyclopedia of Places by W. G. Moore and the Graphical law, [61], The Poems of Tennyson and the Graphical Law, [62], Khasi-Jaintia Jaids(Surnames) and the Graphical law, [63], Age, Amplitude of accommodation and the Graphical law, [64], Dictionary of Ayurveda by Dr. Ravindra Sharma and the Graphical law, [65], respectively.

The planning of the paper is as follows. In the next section, we describe the Graphical Law analysis of words of the Practical Sanskrit-English Dictionary , [1]. The section III, we give an introduction to the standard curves of magnetisation of Ising model. The section IV is Acknowledgment. The last section is Bibliography.

II. THE GRAPHICAL LAW ANALYSIS

For the purpose of exploring graphical law, we assort the letters according to the number of words, in the descending order, denoted by f and the respective rank, [66], denoted by k. k is a positive integer starting from one. Moreover, the minimum non-zero number of words is one. The limiting rank is maximum rank, here it is forty two. As a result both $\frac{lnf}{lnf_{max}}$ and $\frac{lnk}{lnk_{lim}}$ varies from zero to one. Then we tabulate in the adjoining table,II, and plot $\frac{lnf}{lnf_{max}}$ against $\frac{lnk}{lnk_{lim}}$ in the figure fig.5. We then ignore the letter with the highest of words, tabulate in the adjoining table,II,and redo the plot, normalising the lnfs with lnf_{n-max}, and starting from $k = 2$ in the figure fig.7. Normalising the lnfs with lnf_{2n-max}, we tabulate in the adjoining table,II, and starting from $k = 3$ we draw in the figure fig.8. Normalising the lnfs with lnf_{3n-max} we record in the adjoining table,II, and plot starting from $k = 4$ in the figure fig.9. In this way we obtain up to the figure fig.10.

k	lnk	lnk/lnk_{lim}	f	lnf	lnf/lnf_{max}	lnf/lnf_{n-max}	lnf/lnf_{2n-max}	lnf/lnf_{3n-max}	lnf/lnf_{4n-max}	lnf/lnf_{5n-max}
1	0	0	6011	8.701	1	Blank	Blank	Blank	Blank	Blank
2	0.69	0.184	4177	8.337	0.958	1	Blank	Blank	Blank	Blank
3	1.10	0.294	2773	7.928	0.911	0.951	1	Blank	Blank	Blank
4	1.39	0.372	2766	7.925	0.911	0.951	0.9996	1	Blank	Blank
5	1.61	0.430	2353	7.763	0.892	0.931	0.979	0.980	1	Blank
6	1.79	0.479	1901	7.550	0.868	0.906	0.952	0.953	0.973	1
7	1.95	0.521	1669	7.420	0.853	0.890	0.936	0.936	0.956	0.983
8	2.08	0.556	1384	7.233	0.831	0.868	0.912	0.913	0.932	0.958
9	2.20	0.588	1247	7.128	0.819	0.855	0.899	0.899	0.918	0.944
10	2.30	0.615	1070	6.975	0.802	0.837	0.880	0.880	0.898	0.924
11	2.40	0.642	909	6.812	0.783	0.817	0.859	0.860	0.877	0.902
12	2.48	0.663	892	6.793	0.781	0.815	0.857	0.857	0.875	0.900
13	2.56	0.684	678	6.519	0.749	0.782	0.822	0.823	0.840	0.863
14	2.64	0.706	617	6.425	0.738	0.771	0.810	0.811	0.828	0.851
15	2.71	0.725	583	6.368	0.732	0.764	0.803	0.804	0.820	0.843
16	2.77	0.741	510	6.234	0.716	0.748	0.786	0.787	0.803	0.826
17	2.83	0.757	490	6.194	0.712	0.743	0.781	0.782	0.798	0.820
18	2.89	0.773	454	6.118	0.703	0.734	0.772	0.772	0.788	0.810
19	2.94	0.786	425	6.052	0.696	0.726	0.763	0.764	0.780	0.802
20	3.00	0.802	382	5.945	0.683	0.713	0.750	0.750	0.766	0.787
21	3.04	0.813	356	5.875	0.675	0.705	0.741	0.741	0.757	0.778
22	3.09	0.826	297	5.694	0.654	0.683	0.718	0.718	0.733	0.754
23	3.14	0.840	249	5.517	0.634	0.662	0.696	0.696	0.711	0.731
24	3.18	0.850	204	5.318	0.611	0.638	0.671	0.671	0.685	0.704
25	3.22	0.861	175	5.165	0.594	0.620	0.651	0.652	0.665	0.684
26	3.26	0.872	151	5.017	0.577	0.602	0.633	0.633	0.646	0.665
27	3.30	0.882	123	4.812	0.553	0.577	0.607	0.607	0.620	0.637
28	3.33	0.890	108	4.682	0.538	0.562	0.591	0.591	0.603	0.620
29	3.37	0.901	88	4.477	0.515	0.537	0.565	0.565	0.577	0.593
30	3.40	0.909	87	4.466	0.513	0.536	0.563	0.564	0.575	0.592
31	3.43	0.917	83	4.419	0.508	0.530	0.557	0.558	0.569	0.585
32	3.47	0.928	70	4.248	0.488	0.510	0.536	0.536	0.547	0.563
33	3.50	0.936	67	4.205	0.483	0.504	0.530	0.531	0.542	0.557
34	3.53	0.944	61	4.111	0.472	0.493	0.519	0.519	0.530	0.545
35	3.56	0.952	45	3.807	0.438	0.457	0.480	0.480	0.490	0.504
36	3.58	0.957	44	3.784	0.435	0.454	0.477	0.477	0.487	0.501
37	3.61	0.965	37	3.611	0.415	0.433	0.455	0.456	0.465	0.478
38	3.64	0.973	10	2.303	0.265	0.276	0.290	0.291	0.297	0.305
39	3.66	0.979	9	2.197	0.252	0.264	0.277	0.277	0.283	0.291
40	3.69	0.987	4	1.386	0.159	0.166	0.175	0.175	0.179	0.184
41	3.71	0.992	2	0.693	0.080	0.083	0.087	0.087	0.089	0.092
42	3.74	1	1	0	0	0	0	0	0	0

TABLE II. Words of the Practical Sanskrit-English Dictionary by Vaman Shivram Apte: ranking,natural logarithm, normalisations

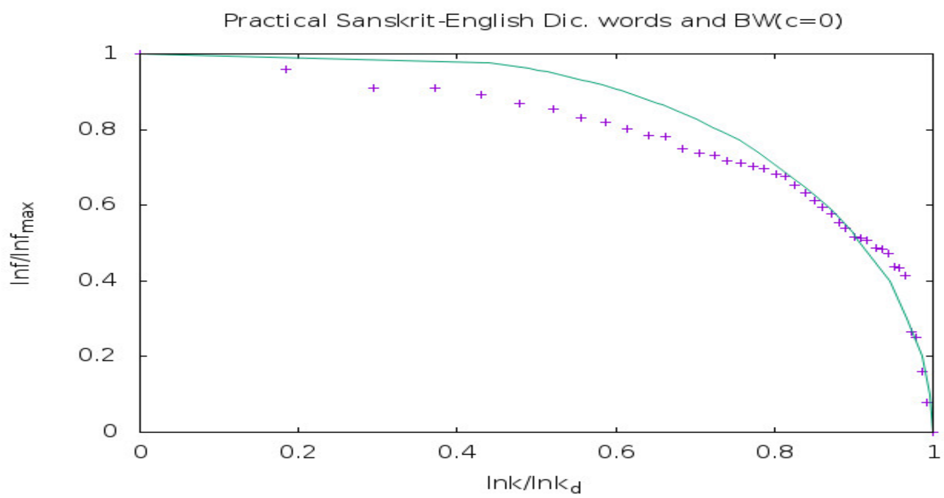

FIG. 3. The vertical axis is $\frac{lnf}{lnf_{max}}$ and the horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the words of the Practical Sanskrit-English Dictionary, with the fit curve being the Bragg-Williams curve, BW(c=0), in the absence of external magnetic field, $c = \frac{H}{\gamma\epsilon} = 0$.

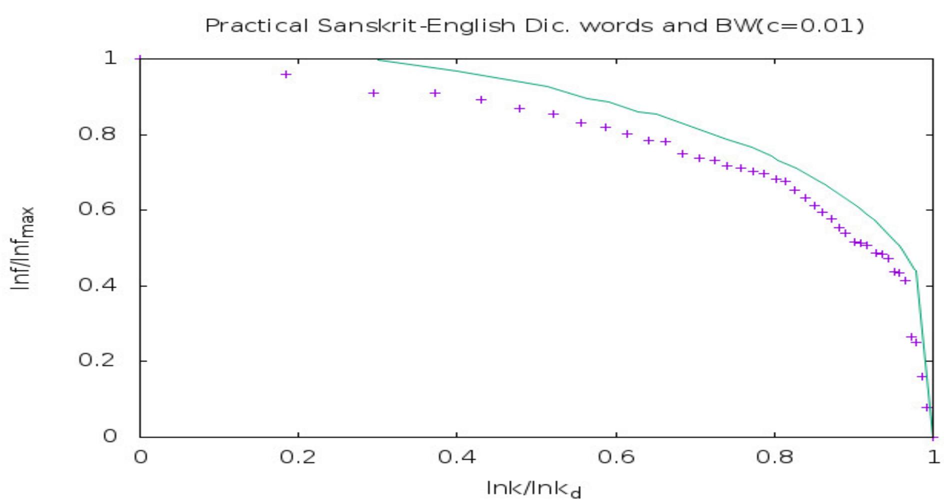

FIG. 4. The vertical axis is $\frac{lnf}{lnf_{max}}$ and the horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the words of the Practical Sanskrit-English Dictionary, with the reference curve being the Bragg-Williams curve, BW(c=0.01), in the presence of external magnetic field, $c = \frac{H}{\gamma\epsilon} = 0$.

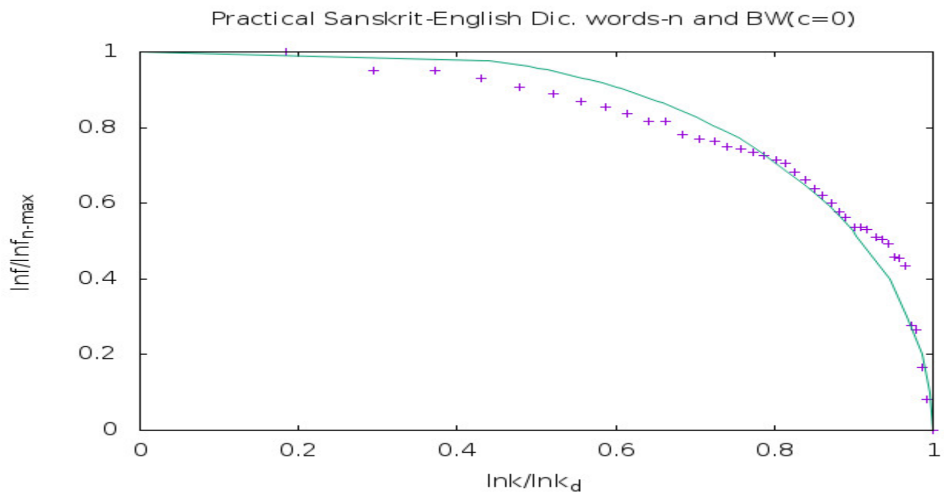

FIG. 5. The vertical axis is $\frac{lnf}{lnf_{n-max}}$ and the horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the words of the Practical Sanskrit-English Dictionary, with the fit curve being the Bragg-Williams curve, BW(c=0), in the absence of external magnetic field, $c = \frac{H}{\gamma\epsilon} = 0$.

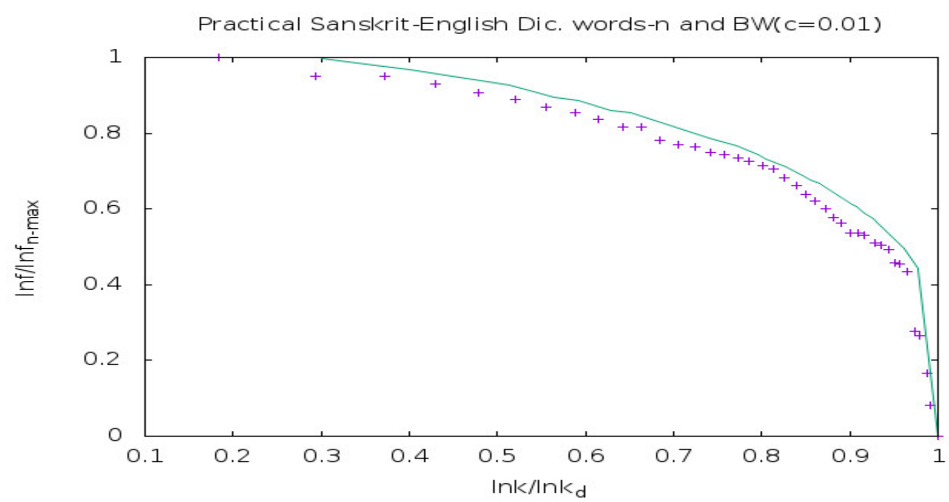

FIG. 6. The vertical axis is $\frac{lnf}{lnf_{n-max}}$ and the horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the words of the Practical Sanskrit-English Dictionary, with the reference curve being the Bragg-Williams curve, BW(c=0.01), in the presence of external magnetic field, $c = \frac{H}{\gamma\epsilon} = 0$.

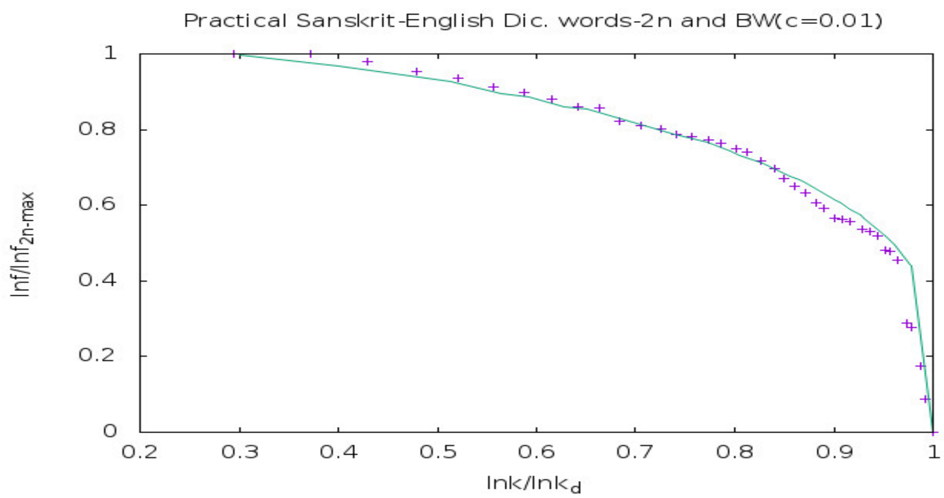

FIG. 7. The vertical axis is $\frac{lnf}{lnf_{2n-max}}$ and the horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the words of the Practical Sanskrit-English Dictionary, with the fit curve being the Bragg-Williams curve, BW(c=0.01), in the presence of external magnetic field, $c = \frac{H}{\gamma\epsilon} = 0.01$.

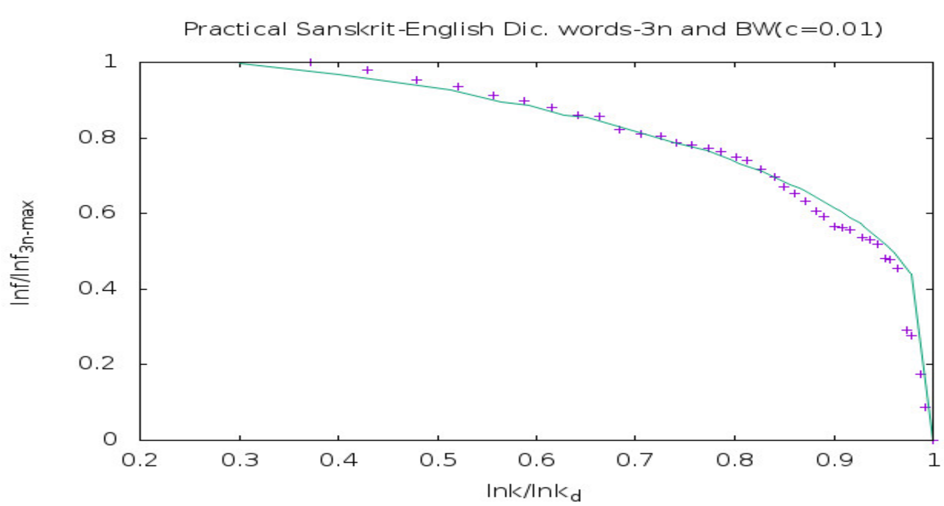

FIG. 8. The vertical axis is $\frac{lnf}{lnf_{3n-max}}$ and the horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the words of the Practical Sanskrit-English Dictionary, with the fit curve being the Bragg-Williams curve, BW(c=0.01), in the presence of external magnetic field, $c = \frac{H}{\gamma\epsilon} = 0.01$.

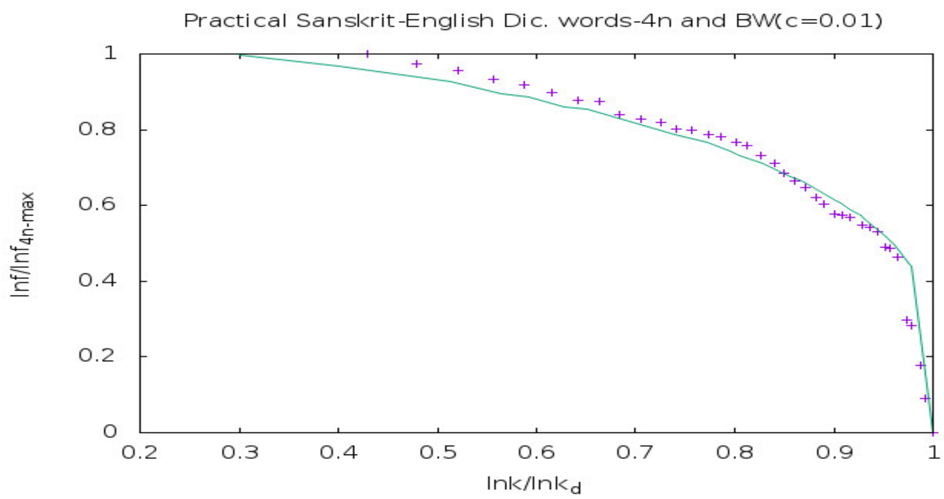

FIG. 9. The vertical axis is $\frac{lnf}{lnf_{4n-max}}$ and the horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the words of the Practical Sanskrit-English Dictionary, with the fit curve being the Bragg-Williams curve, BW(c=0.01), in the presence of external magnetic field, $c = \frac{H}{\gamma\epsilon} = 0.01$.

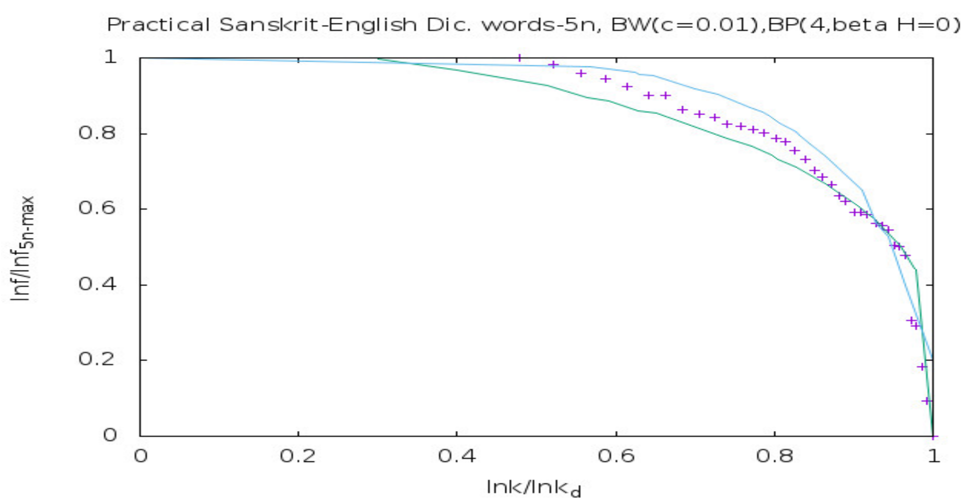

FIG. 10. The vertical axis is $\frac{lnf}{lnf_{5n-max}}$ and the horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the words of the Practical Sanskrit-English Dictionary, with the reference curves being the Bragg-Williams curve, BW(c=0.01), in the presence of external magnetic field, $c = \frac{H}{\gamma\epsilon} = 0.01$, lower one and BP(4,$\beta H = 0$), the Bethe-Peierls curve in the presence of four nearest neighbours and in the absence of external magnetic field, $m = 0$ or, $\beta H = 0$, upper one.

A. conclusion

From the figures (fig.3-fig.10), we observe that there is a curve of magnetisation, behind the words of the Practical Sanskrit-English Dictionary by Vaman Shivram Apte,[1]. This is the magnetisation curve, BW(c=0.01), in the Bragg-Williams approximation of the Ising model, in the presence of external magnetic field, $c = \frac{H}{\gamma\epsilon} = 0.01$.
Moreover, the associated correspondence is,

$$\frac{lnf}{lnf_{2n-max}} \longleftrightarrow \frac{M}{M_{max}},$$

$$lnk \longleftrightarrow T.$$

k corresponds to temperature in an exponential scale, [73].

III. APENDIX: MAGNETISATION

A. Bragg-Williams approximation

Let us consider a coin. Let us toss it many times. Probability of getting head or, tale is half i.e. we will get head and tale equal number of times. If we attach value one to head, minus one to tale, the average value we obtain, after many tossing is zero. Instead let us consider a one-sided loaded coin, say on the head side. The probability of getting head is more than one half, getting tale is less than one-half. Average value, in this case, after many tossing we obtain is non-zero, the precise number depends on the loading. The loaded coin is like ferromagnet, the unloaded coin is like para magnet, at zero external magnetic field. Average value we obtain is like magnetisation, loading is like coupling among the spins of the ferromagnetic units. Outcome of single coin toss is random, but average value we get after long sequence of tossing is fixed. This is long-range order. But if we take a small sequence of tossing, say, three consecutive tossing, the average value we obtain is not fixed, can be anything. There is no short-range order.

Let us consider a row of spins, one can imagine them as spears which can be vertically up or, down. Assume there is a long-range order with probability to get a spin up is two third. That would mean when we consider a long sequence of spins, two third of those are with spin up. Moreover, assign with each up spin a value one and a down spin a value minus one. Then total spin we obtain is one third. This value is referred to as the value of long-range order parameter. Now consider a short-range order existing which is identical with the long-range order. That would mean if we pick up any three consecutive spins, two will be up, one down. Bragg-Williams approximation means short-range order is identical with long-range order, applied to a lattice of spins, in general. Row of spins is a lattice of one dimension.

Now let us imagine an arbitrary lattice, with each up spin assigned a value one and a down spin a value minus one, with an unspecified long-range order parameter defined as above by $L = \frac{1}{N}\Sigma_i \sigma_i$, where σ_i is i-th spin, N being total number of spins. L can vary from minus one to one. $N = N_+ + N_-$, where N_+ is the number of up spins, N_- is the number of down spins. $L = \frac{1}{N}(N_+ - N_-)$. As a result, $N_+ = \frac{N}{2}(1+L)$ and $N_- = \frac{N}{2}(1-L)$. Magnetisation or, net magnetic moment , M is $\mu\Sigma_i\sigma_i$ or, $\mu(N_+ - N_-)$ or, $\mu N L$, $M_{max} = \mu N$. $\frac{M}{M_{max}} = L$. $\frac{M}{M_{max}}$ is referred to as reduced magnetisation. Moreover, the Ising Hamiltonian,[67], for the lattice of spins, setting μ to one, is $-\epsilon\Sigma_{n.n}\sigma_i\sigma_j - H\Sigma_i\sigma_i$, where n.n refers to nearest neighbour pairs. The difference $\triangle E$ of energy if we flip an up spin to down spin is, [68], $2\epsilon\gamma\bar{\sigma} + 2H$, where γ is the number of nearest neighbours of a spin. According to Boltzmann principle, $\frac{N_-}{N_+}$ equals $exp(-\frac{\triangle E}{k_B T})$, [69]. In the Bragg-Williams approximation,[70], $\bar{\sigma} = L$, considered in the thermal average sense. Consequently,

$$ln\frac{1+L}{1-L} = 2\frac{\gamma\epsilon L + H}{k_B T} = 2\frac{L + \frac{H}{\gamma\epsilon}}{\frac{T}{\gamma\epsilon/k_B}} = 2\frac{L+c}{\frac{T}{T_c}} \tag{1}$$

where, $c = \frac{H}{\gamma\epsilon}$, $T_c = \gamma\epsilon/k_B$, [71]. $\frac{T}{T_c}$ is referred to as reduced temperature.
Plot of L vs $\frac{T}{T_c}$ or, reduced magentisation vs. reduced temperature is used as reference curve. In the presence of magnetic field, $c \neq 0$, the curve bulges outward. Bragg-Williams is a Mean Field approximation. This approximation holds when number of neighbours interacting with a site is very large, reducing the importance of local fluctuation or, local order, making the long-range order or, average degree of freedom as the only degree of freedom of the lattice. To have a feeling how this approximation leads to matching between experimental and Ising model prediction one can refer to FIG.12.12 of [68]. W. L. Bragg was a professor of Hans Bethe. Rudolf Peierls was a friend of Hans Bethe. At the suggestion of W. L. Bragg, Rudolf Peierls following Hans Bethe improved the approximation scheme, applying quasi-chemical method.

B. Bethe-peierls approximation in presence of four nearest neighbours, in absence of external magnetic field

In the approximation scheme which is improvement over the Bragg-Williams, [67],[68],[69],[70],[71], due to Bethe-Peierls, [72], reduced magnetisation varies with reduced temperature, for γ neighbours, in absence of external magnetic field, as

$$\frac{ln\frac{\gamma}{\gamma-2}}{ln\frac{factor-1}{factor^{\frac{\gamma-1}{\gamma}} - factor^{\frac{1}{\gamma}}}} = \frac{T}{T_c}; factor = \frac{\frac{M}{M_{max}}+1}{1-\frac{M}{M_{max}}}. \tag{2}$$

$ln\frac{\gamma}{\gamma-2}$ for four nearest neighbours i.e. for $\gamma = 4$ is 0.693. For a snapshot of different kind of magnetisation curves for magnetic materials the reader is urged to give a google search "reduced magnetisation vs reduced temperature curve". In the following, we describe

BW	BW(c=0.01)	BP(4,βH = 0)	reduced magnetisation
0	0	0	1
0.435	0.439	0.563	0.978
0.439	0.443	0.568	0.977
0.491	0.495	0.624	0.961
0.501	0.507	0.630	0.957
0.514	0.519	0.648	0.952
0.559	0.566	0.654	0.931
0.566	0.573	0.7	0.927
0.584	0.590	0.7	0.917
0.601	0.607	0.722	0.907
0.607	0.613	0.729	0.903
0.653	0.661	0.770	0.869
0.659	0.668	0.773	0.865
0.669	0.676	0.784	0.856
0.679	0.688	0.792	0.847
0.701	0.710	0.807	0.828
0.723	0.731	0.828	0.805
0.732	0.743	0.832	0.796
0.756	0.766	0.845	0.772
0.779	0.788	0.864	0.740
0.838	0.853	0.911	0.651
0.850	0.861	0.911	0.628
0.870	0.885	0.923	0.592
0.883	0.895	0.928	0.564
0.899	0.918		0.527
0.904	0.926	0.941	0.513
0.946	0.968	0.965	0.400
0.967	0.998	0.965	0.300
0.987		1	0.200
0.997		1	0.100
1	1	1	0

TABLE III. Reduced magnetisation vs reduced temperature data s for Bragg-Williams approximation, in absence of and in presence of magnetic field, $c = \frac{H}{\gamma\epsilon} = 0.01$, and Bethe-Peierls approximation in absence of magnetic field, for four nearest neighbours.

data s generated from the equation(1) and the equation(2) in the table, III, and curves of magnetisation plotted on the basis of those data s. BW stands for reduced temperature in Bragg-Williams approximation, calculated from the equation(1). BP(4) represents reduced temperature in the Bethe-Peierls approximation, for four nearest neighbours, computed from the equation(2). The data set is used to plot fig.11. Empty spaces in the table, III, mean corresponding point pairs were not used for plotting a line.

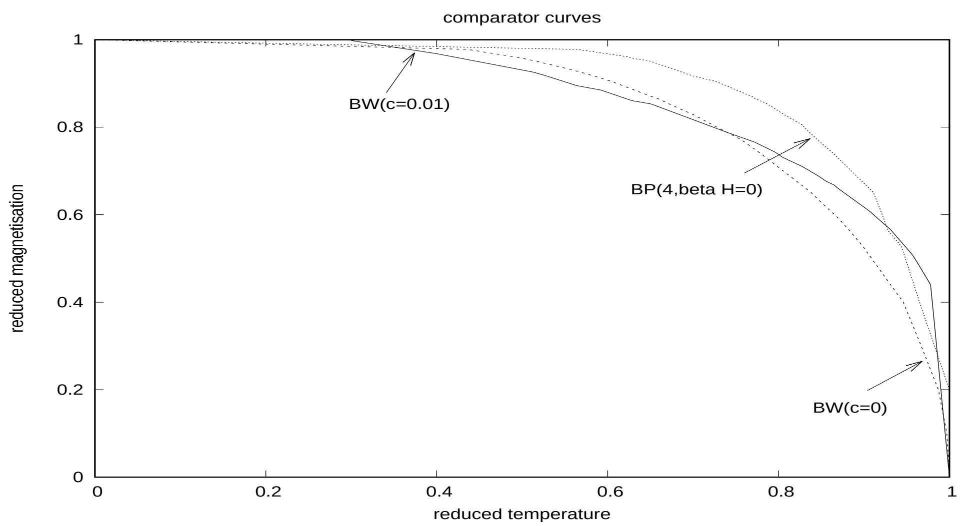

FIG. 11. Reduced magnetisation vs reduced temperature curves for Bragg-Williams approximation, in absence(dark) of and presence(inner in the top) of external magnetic field, $c = \frac{H}{\gamma\epsilon} = 0.01$, and Bethe-Peierls approximation in absence of external magnetic field, for four nearest neighbours (outer in the top).

IV. ACKNOWLEDGMENT

We have used gnuplot for plotting the figures in this paper. A preliminary exercise in the graphical law analysis was undertaken in our first work, [2], for the famous Sanskrit-English Dictionary by Professor Monier Williams, [74]. It is desirable to do thorough graphical law analysis along the line of this paper for the Sanskrit-English Dictionary by Professor Monier Williams, [74].

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