Khasi English Dictionary and the Graphical law

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Abstract

We study Khasi English Dictionary by U Nissor Singh. We draw the natural logarithm of the number of entries, 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 BP(4,βH=0) i.e. a magnetisation curve for the Bethe-Peierls approximation of the Ising model with four nearest neighbours and in the absence of external magnetic field, H, with βH=0. β is $\frac{1}{k_B T}$ where, T is temperature and k_B is the tiny Boltzmann constant.

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I. INTRODUCTION

Khasi people comes from Khasi Hills of Meghalaya, India. The people are referred to as Khasi, their language is known as the Khasi language. Khublei in the Khasi language means God bless you, la wan? means came?, leit means to go, a-iu means what, bâm means to eat, dih means to drink, sha means tea, mynstep means morning, sngi means sun, dieng means tree, snem means a year, balei means why, khyndái means nine and so on. In 1904, a dictionay, [1], of this language was completed, based on the Cherra dialect, by U Nissor Singh. Here, in this paper we go through this dictionary thoroughly.

In this article, we try to do a thorough study of magnetic field pattern behind the dictionary of the Khasi language,[1]. 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 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] and the Visayan-English Dictionary, [12], Garo to English School Dictionary, [13], Mursi-English-Amharic Dicionary, [14], Names of Minor Planets, [15], A Dictionary of Tibetan and English, [16], respectively.

In our first paper, [2], we have studied the Khasi English Dicionary,[1]. There we took resort to average counting i.e. finding an average number of words par page and multiplying by the number of pages corresponding to a letter we obtained the number of words starting with a letter. We deduced that the dictionary,[1], is characterised by BW(c=0). Here, in this paper we leave behind the approximate method. We count thoroughly, one by one each word. Moreover, we augment the analysis. We conclude here, that the dictionary can be characterised by BP(4,βH=0).

The planning of the paper is as follows. We give an introduction to the standard curves of magnetisation of Ising model in the section II. In the section III, we describe analysis of the entries of the Khasi language, [1]. Sections IV, V are Acknowledgement and Bibliography respectively.

II. 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 paramagnet, 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, μNL, $M_{max} = \mu N$. $\frac{M}{M_{max}} = L$. $\frac{M}{M_{max}}$ is referred to as reduced magnetisation. Moreover, the Ising Hamiltonian,[17], 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, [18], $2\epsilon\gamma\bar{\sigma} + 2H$, where γ is the number of nearest neighbours of a spin. According to Boltzmann principle, $\frac{N_-}{N_+}$ equals $exp(-\frac{\triangle E}{k_B T})$, [19]. In the Bragg-Williams approximation,[20], $\bar{\sigma} = L$, 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, $c = \frac{H}{\gamma\epsilon}$, $T_c = \gamma\epsilon/k_B$, [21]. $\frac{T}{T_c}$ 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 [18]. W. L. Bragg was a professor of Hans Bethe. Rudlof Peierls was a friend of Hans Bethe. At the suggestion of W. L. Bragg, Rudlof 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, [17],[18],[19],[20],[21], due to Bethe-Peierls, [22], reduced magnetisation varies with reduced temperature, for γ neighbours, in absence of external magnetic field, as

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

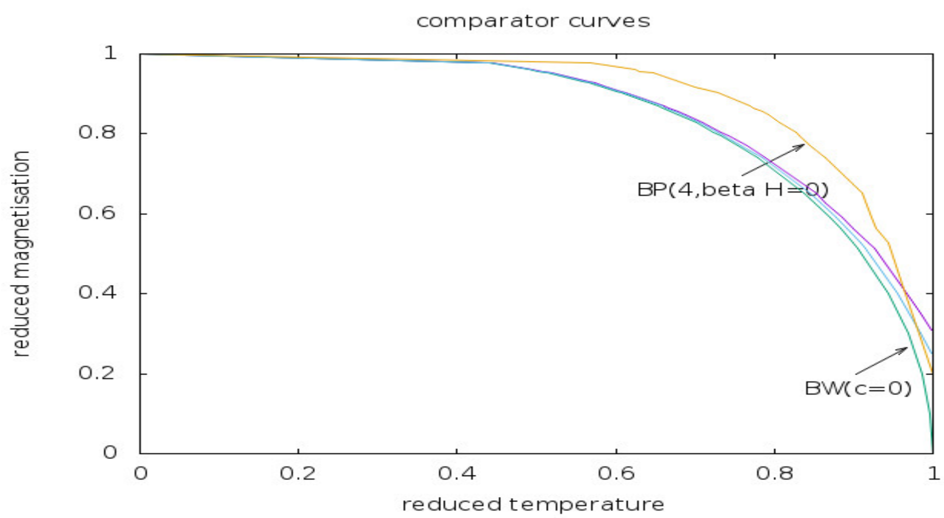

FIG. 1. Reduced magnetisation vs reduced temperature curves, for the Bragg-Williams approximation, in the absence (BW(c=0)) and in the presence (BW(c=0.005), BW(c=0.01)) of magnetic field, $c = 0$, $c = \frac{H}{\gamma\epsilon} = 0.005$, $c = \frac{H}{\gamma\epsilon} = 0.01$, outwards; and in the Bethe-Peierls approximation, BP(4,βH=0), in the absence of magnetic field, for four nearest neighbours (outer in the top).

$ln\frac{\gamma}{\gamma-2}$ 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 datas generated from the equation(1) and the equation(2) in the table, I, and curves of magnetisation plotted on the basis of those datas. 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.1. Empty spaces in the table, I, mean corresponding point pairs were not used for plotting a line.

reduced temperature, $\frac{T}{T_c}$				$\frac{M}{M_{max}}$,
BW(c=0)	BW(c=0.005)	BW(c=0.01)	BP(4,βH = 0)	reduced magnetisation
0	0	0	0	1
0.435	0.437	0.439	0.563	0.978
0.439	0.441	0.443	0.568	0.977
0.491	0.493	0.495	0.624	0.961
0.501	0.504	0.507	0.630	0.957
0.514	0.517	0.519	0.648	0.952
0.559	0.562	0.565	0.654	0.931
0.566	0.569	0.573	0.7	0.927
0.584	0.587	0.590	0.7	0.917
0.601	0.604	0.607	0.722	0.907
0.607	0.610	0.613	0.729	0.903
0.653	0.658	0.661	0.770	0.869
0.659	0.663	0.666	0.773	0.865
0.669	0.674	0.678	0.784	0.856
0.679	0.684	0.688	0.792	0.847
0.701	0.705	0.709	0.807	0.828
0.723	0.728	0.732	0.828	0.805
0.732	0.736	0.743	0.832	0.796
0.753	0.758	0.766	0.845	0.772
0.779	0.784	0.788	0.864	0.740
0.838	0.844	0.853	0.911	0.651
0.850	0.858	0.864	0.911	0.628
0.870	0.877	0.885	0.923	0.592
0.883	0.891	0.899	0.928	0.564
0.899	0.908	0.918		0.527
0.905	0.914	0.926	0.941	0.513
0.944	0.956	0.968	0.965	0.400
		0.985		0.350
		0.998		0.310
0.969	0.985		0.965	0.300
	0.998			0.250
0.987			1	0.200
0.997			1	0.100
1			1	0

TABLE I. Datas for Reduced temperature[for the Bragg-Williams approximation, in the absence (BW(c=0)) and in the presence (BW(c=0.005), BW(c=0.01)) of magnetic field, $c = 0$, $c = \frac{H}{\gamma\epsilon} = 0.005$, $c = \frac{H}{\gamma\epsilon} = 0.01$ respectively and in the Bethe-Peierls approximation, BP(4,βH=0), in the absence of magnetic field, for four nearest neighbours] vs reduced magnetisation. Reduced temperature data set(say, data set BW(c=0)) is drawn along the x-axis and the corresponding Reduced magnetisation data set is drawn along the y-axis. In gnuplot the command is plot ".dat" using 1:2 with line; 1 standing for x-axis and 2 standing for y-axis datas.[For example, for drawing BW(c=0), ".dat" file, say denoted as "0.dat", contains BW(c=0) data set in first column and reduced magnetisation data set in second column. Moreover, after (0.944,0.400), next pair of points will be (0.969,0.300), then (0.987,0.200), .and so on in the "0.dat" file.]

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

In the Bethe-Peierls approximation scheme , [22], reduced magnetisation varies with reduced temperature, for γ neighbours, in presence of external magnetic field, as

$$\frac{ln\frac{\gamma}{\gamma-2}}{ln\frac{factor-1}{e^{\frac{2\beta H}{\gamma}}factor^{\frac{\gamma-1}{\gamma}}-e^{-\frac{2\beta H}{\gamma}}factor^{\frac{1}{\gamma}}}}=\frac{T}{T_c};factor=\frac{\frac{M}{M_{max}}+1}{1-\frac{M}{M_{max}}}. \tag{3}$$

Derivation of this formula ala [22] is given in the appendix of [7].

$ln\frac{\gamma}{\gamma-2}$ for four nearest neighbours i.e. for $\gamma = 4$ is 0.693. For four neighbours,

$$\frac{0.693}{ln\frac{factor-1}{e^{\frac{2\beta H}{\gamma}}factor^{\frac{\gamma-1}{\gamma}}-e^{-\frac{2\beta H}{\gamma}}factor^{\frac{1}{\gamma}}}}=\frac{T}{T_c};factor=\frac{\frac{M}{M_{max}}+1}{1-\frac{M}{M_{max}}}. \tag{4}$$

In the following, we describe datas in the table, II, generated from the equation(4) and curves of magnetisation plotted on the basis of those datas. BP(m=0.03) stands for reduced temperature in Bethe-Peierls approximation, for four nearest neighbours, in presence of a variable external magnetic field, H, such that $\beta H = 0.06$. calculated from the equation(4). BP(m=0.025) stands for reduced temperature in Bethe-Peierls approximation, for four nearest neighbours, in presence of a variable external magnetic field, H, such that $\beta H = 0.05$. calculated from the equation(4). BP(m=0.02) stands for reduced temperature in Bethe-Peierls approximation, for four nearest neighbours, in presence of a variable external magnetic field, H, such that $\beta H = 0.04$. calculated from the equation(4). BP(m=0.01) stands for reduced temperature in Bethe-Peierls approximation, for four nearest neighbours, in presence of a variable external magnetic field, H, such that $\beta H = 0.02$. calculated from the equation(4). BP(m=0.005) stands for reduced temperature in Bethe-Peierls approximation, for four nearest neighbours, in presence of a variable external magnetic field, H, such that $\beta H = 0.01$. calculated from the equation(4). The data set is used to plot fig.2. Empty spaces in the table, II, mean corresponding point pairs were not used for plotting a line.

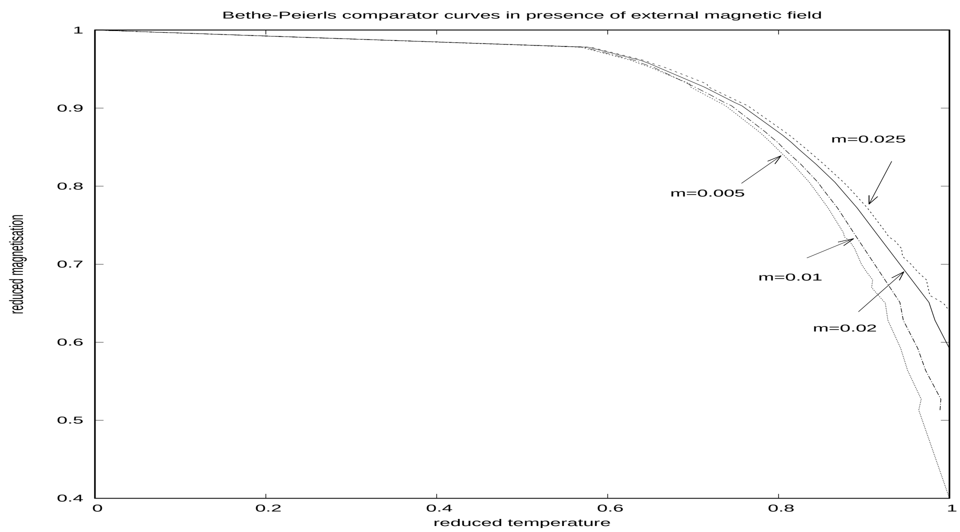

FIG. 2. Reduced magnetisation vs reduced temperature curves for Bethe-Peierls approximation in presence of little external magnetic fields, for four nearest neighbours, with $\beta H = 2m$.

reduced temperature, $\frac{T}{T_c}$					$\frac{M}{M_{max}}$,
BP(m=0.03)	BP(m=0.025)	BP(m=0.02)	BP(m=0.01)	BP(m=0.005)	reduced magnetisation
0	0	0	0	0	1
0.583	0.580	0.577	0.572	0.569	0.978
0.587	0.584	0.581	0.575	0.572	0.977
0.647	0.643	0.639	0.632	0.628	0.961
0.657	0.653	0.649	0.641	0.637	0.957
0.671	0.667		0.654	0.650	0.952
	0.716			0.696	0.931
0.723	0.718	0.713	0.702	0.697	0.927
0.743	0.737	0.731	0.720	0.714	0.917
0.762	0.756	0.749	0.737	0.731	0.907
0.770	0.764	0.757	0.745	0.738	0.903
0.816	0.808	0.800	0.785	0.778	0.869
0.821	0.813	0.805	0.789	0.782	0.865
0.832	0.823	0.815	0.799	0.791	0.856
0.841	0.833	0.824	0.807	0.799	0.847
0.863	0.853	0.844	0.826	0.817	0.828
0.887	0.876	0.866	0.846	0.836	0.805
0.895	0.884	0.873	0.852	0.842	0.796
0.916	0.904	0.892	0.869	0.858	0.772
0.940	0.926	0.914	0.888	0.876	0.740
	0.929			0.877	0.735
	0.936			0.883	0.730
	0.944			0.889	0.720
	0.945				0.710
	0.955			0.897	0.700
	0.963			0.903	0.690
	0.973			0.910	0.680
				0.909	0.670
	0.993			0.925	0.650
		0.976	0.942		0.651
	1.00				0.640
		0.983	0.946	0.928	0.628
		1.00	0.963	0.943	0.592
			0.972	0.951	0.564
			0.990	0.967	0.527
				0.964	0.513
			1.00		0.500
				1.00	0.400
					0.300
					0.200
					0.100
					0

TABLE II. Bethe-Peierls approx. in presence of little external magnetic fields

D. Onsager solution

At a temperature T, below a certain temperature called phase transition temperature, T_c, for the two dimensional Ising model in absence of external magnetic field i.e. for H equal to zero, the exact, unapproximated, Onsager solution gives reduced magnetisation as a function of reduced temperature as, [23], [24], [25], [22],

$$\frac{M}{M_{max}} = [1 - (sinh\frac{0.8813736}{\frac{T}{T_c}})^{-4}]^{1/8}.$$

Graphically, the Onsager solution appears as in fig.3.

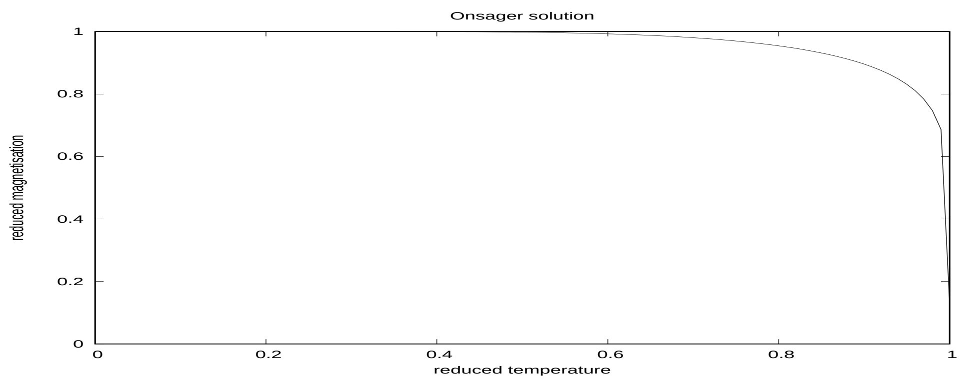

FIG. 3. Reduced magnetisation vs reduced temperature curves for exact solution of two dimensional Ising model, due to Onsager, in absence of external magnetic field

A	B	K	D	E	G	NG	H	I	J	L	M	N	O	P	R	S	T	U	W	Y
159	383	1152	331	34	7	60	123	298	354	495	380	256	21	606	269	1089	624	59	73	12

TABLE III. Entries of the Khasi English Dictionary: the first row represents letters of the Khasi alphabet in the serial order, the second row is the respective number of entries.

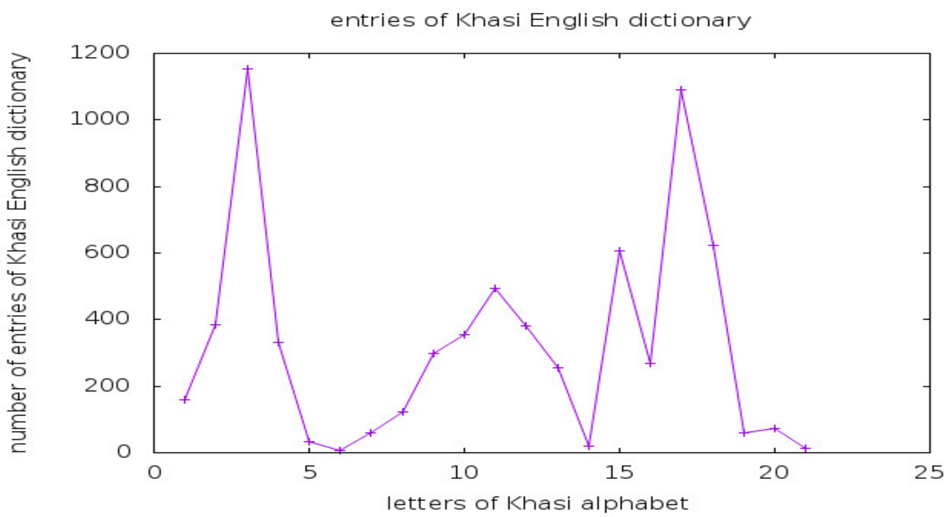

FIG. 4. Vertical axis is number of entries of the Khasi English Dictionary,[1]. Horizontal axis is the letters of the Khasi alphabet. Letters are represented by the sequence number in the alphabet.

III. METHOD OF STUDY AND RESULTS

The Khasi language is composed of twenty one letters. We count all the entries in the dictionary, [1], one by one from the beginning to the end, starting with different letters. The result is the following table, III. Highest number of entries, one thousand one hundred fifty two, starts with the letter K followed by words numbering one thousand eighty nine beginning with S, six hundred tewnty four with the letter T etc. To visualise we plot the number of entries against the respective letters in the figure fig.4. 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, [26], denoted by k. k is a positive integer starting from one. Moreover, we attach a limiting rank, k_{lim}, and a limiting number of words. The limiting rank is maximum rank plus one, here it is twenty two and the limiting number of words is one. 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, IV, and plot $\frac{lnf}{lnf_{max}}$ against $\frac{lnk}{lnk_{lim}}$ in the figure fig.5.

We then ignore the letter with the highest number of words, tabulate in the adjoining table, IV, and redo the plot, normalising the lnfs with next-to-maximum $lnf_{nextmax}$, and starting from $k = 2$ in the figure fig.6. Normalising the lnfs with next-to-next-to-maximum $lnf_{nextnextmax}$, we tabulate in the adjoining table, IV, and starting from $k = 3$ we draw in the figure fig.7. Normalising the lnfs with next-to-next-to-next-to-maximum $lnf_{nextnextnextmax}$ we record in the adjoining table, IV, and plot starting from $k = 4$ in the figure fig.8. Normalising the lnfs with 4n-maximum lnf_{4n-max} we record in the adjoining table, IV, and plot starting from $k = 5$ in the figure fig.9. Normalising the lnfs with 5n-maximum lnf_{5n-max} we record in the adjoining table, IV, and plot starting from $k = 6$ in the figure fig.10, with 6n-maximum $lnf_{10n-max}$ we record in the adjoining table, IV, and plot starting from $k = 11$ in the figure fig.11.

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}	lnf/$lnf_{10n-max}$
1	0	0	1152	7.049	1	Blank	Blank	Blank	Blank	Blank	Blank
2	0.69	0.223	1089	6.993	0.992	1	Blank	Blank	Blank	Blank	Blank
3	1.10	0.356	624	6.436	0.913	0.920	1	Blank	Blank	Blank	Blank
4	1.39	0.450	606	6.407	0.909	0.916	0.995	1	Blank	Blank	Blank
5	1.61	0.521	495	6.205	0.880	0.887	0.964	0.968	1	Blank	Blank
6	1.79	0.579	383	5.948	0.844	0.851	0.924	0.928	0.959	1	Blank
7	1.95	0.631	380	5.940	0.843	0.849	0.923	0.927	0.957	0.999	Blank
8	2.08	0.673	354	5.869	0.833	0.839	0.912	0.916	0.946	0.987	Blank
9	2.20	0.712	331	5.802	0.823	0.830	0.901	0.906	0.935	0.975	Blank
10	2.30	0.744	298	5.697	0.808	0.815	0.885	0.889	0.918	0.958	Blank
11	2.40	0.777	269	5.595	0.794	0.800	0.869	0.873	0.902	0.941	1
12	2.48	0.803	256	5.545	0.787	0.793	0.862	0.865	0.894	0.932	0.991
13	2.56	0.828	159	5.069	0.719	0.725	0.788	0.791	0.817	0.852	0.906
14	2.64	0.854	123	4.812	0.683	0.688	0.748	0.751	0.776	0.809	0.860
15	2.71	0.877	73	4.290	0.609	0.613	0.667	0.670	0.691	0.721	0.767
16	2.77	0.896	60	4.094	0.581	0.585	0.636	0.639	0.660	0.688	0.732
17	2.83	0.916	59	4.078	0.579	0.583	0.634	0.636	0.657	0.686	0.729
18	2.89	0.935	34	3.526	0.500	0.504	0.548	0.550	0.568	0.593	0.630
19	2.94	0.951	21	3.045	0.432	0.435	0.473	0.475	0.491	0.512	0.544
20	3.00	0.971	12	2.485	0.353	0.355	0.386	0.388	0.400	0.418	0.444
21	3.04	0.984	7	1.946	0.276	0.278	0.302	0.304	0.314	0.327	0.348
22	3.09	1	1	0	0	0	0	0	0	0	0

TABLE IV. Entries of the Khasi English dictionary: ranking,natural logarithm, normalisations

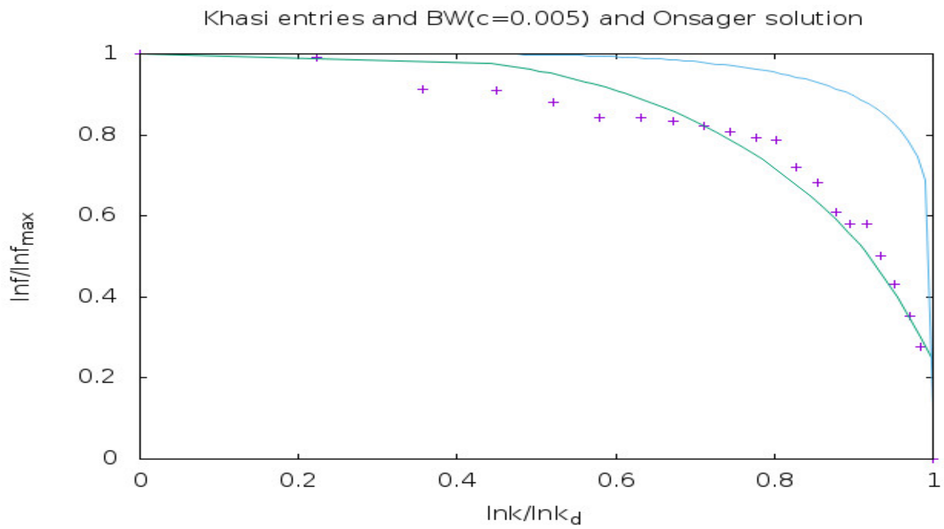

FIG. 5. Vertical axis is $\frac{lnf}{lnf_{max}}$ and horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the entries of the Khasi language with the fit curve being Bragg-Williams approximation curve in the presence of external magnetic field, H, with $c = \frac{H}{\gamma\epsilon} = 0.005$. The uppermost curve is the Onsager solution.

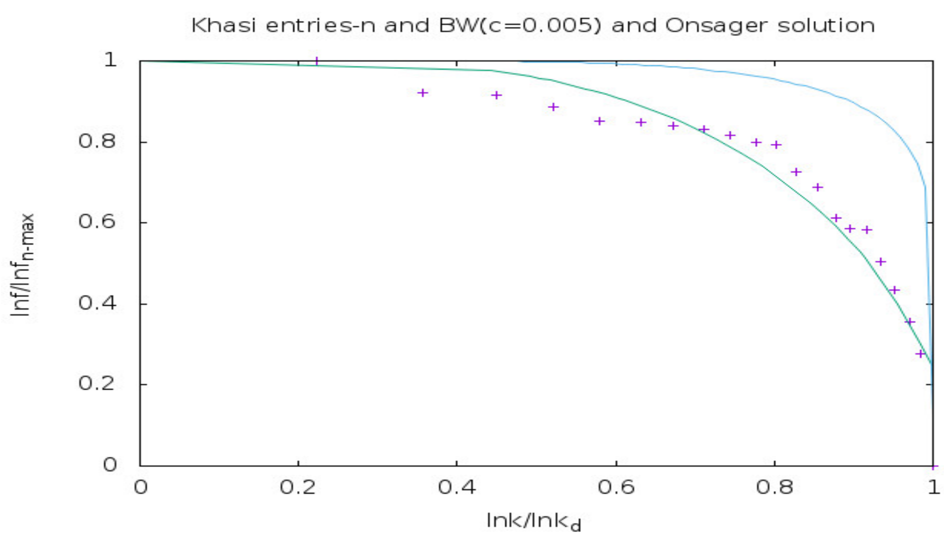

FIG. 6. Vertical axis is $\frac{lnf}{lnf_{n-max}}$ and horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the entries of the Khasi language with the fit curve being Bragg-Williams approximation curve in the presence of external magnetic field, H, with $c = \frac{H}{\gamma\epsilon} = 0.005$. The uppermost curve is the Onsager solution.

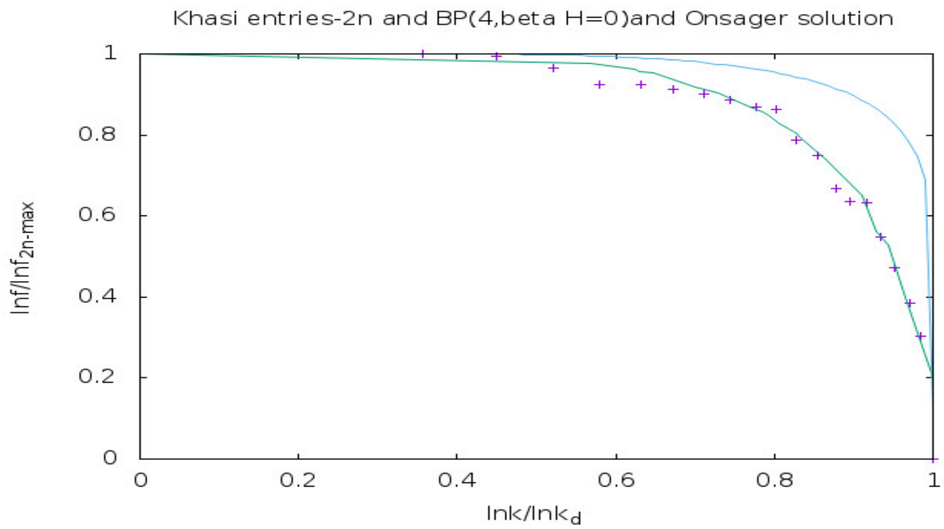

FIG. 7. Vertical axis is $\frac{lnf}{lnf_{2n-max}}$ and horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the entries of the Khasi language with the fit curve being Bethe-Peierls curve in presence of four neighbours in the absence of external magnetic field. The uppermost curve is the Onsager solution.

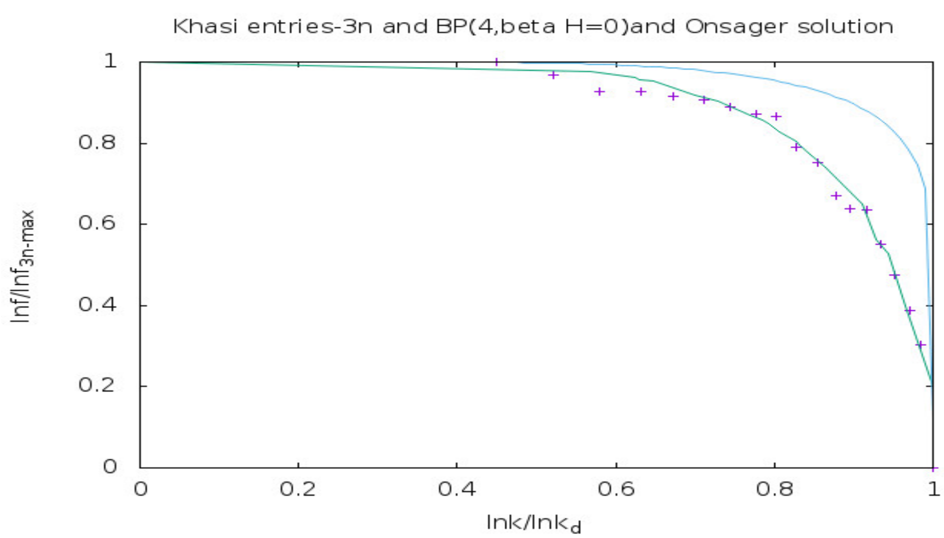

FIG. 8. Vertical axis is $\frac{lnf}{lnf_{3n-max}}$ and horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the entries of the Khasi language with the fit curve being Bethe-Peierls curve in presence of four neighbours and in the absence of external magnetic field. The uppermost curve is the Onsager solution.

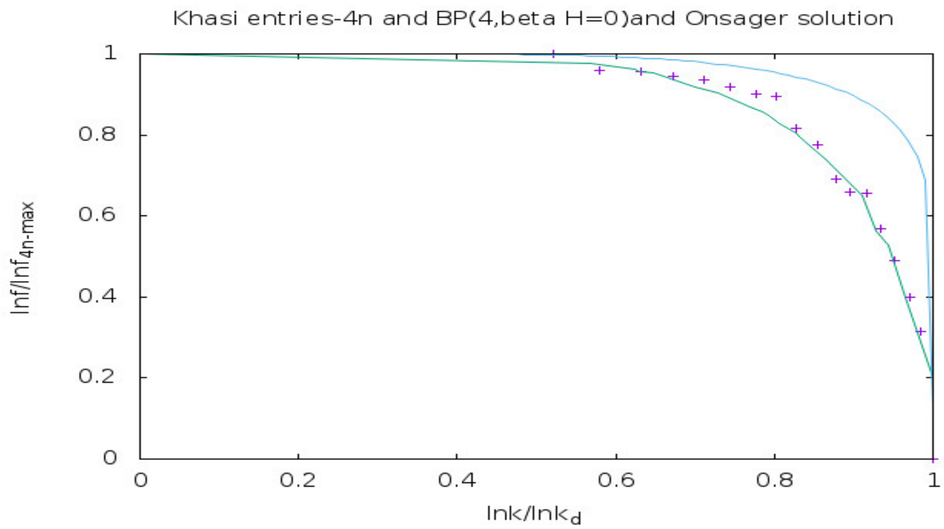

FIG. 9. Vertical axis is $\frac{lnf}{lnf_{4n-max}}$ and horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the entries of the Khasi language with the fit curve being Bethe-Peierls curve in presence of four neighbours and in the absence of external magnetic field. The uppermost curve is the Onsager solution.

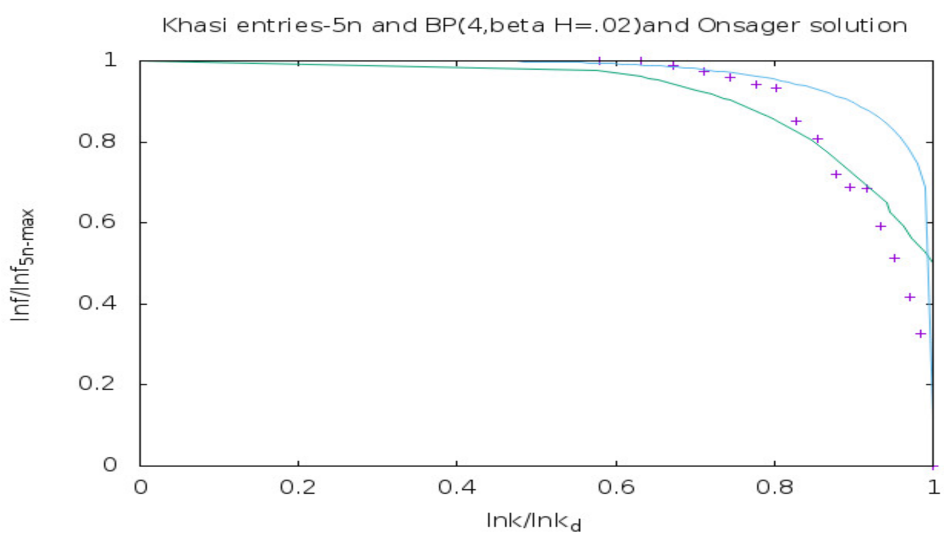

FIG. 10. Vertical axis is $\frac{lnf}{lnf_{5n-max}}$ and horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the entries of the Khasi language with the fit curve being Bethe-Peierls curve in the presence of four nearest neighbours and little magnetic field, $m = 0.01$ or, $\beta H = 0.02$. The uppermost curve is the Onsager solution.

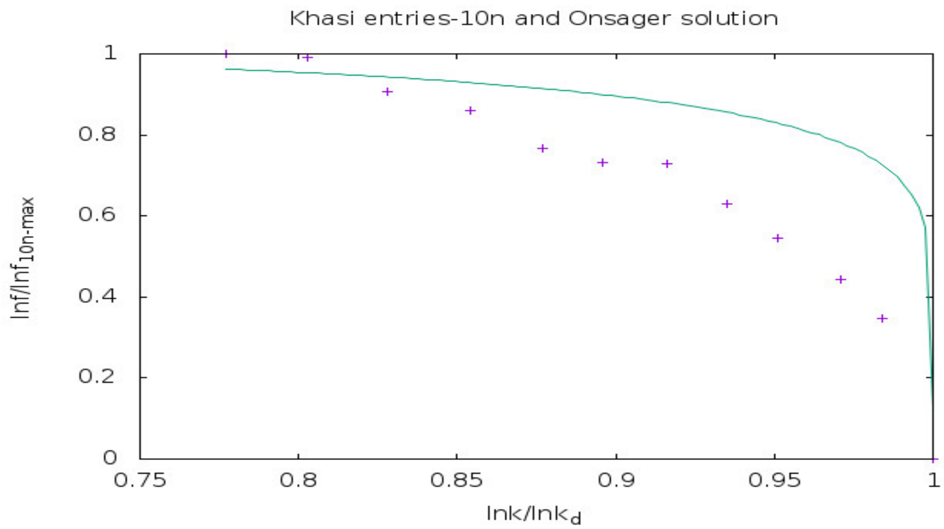

FIG. 11. Vertical axis is $\frac{lnf}{lnf_{10n-max}}$ and horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the entries of the Khasi language. The uppermost curve is the Onsager solution. The points of the Khasi language do not go over to Onsager's solution i.e. the Khasi language as viewed through this dictionary does not have Onsager core.

1. *conclusion*

From the figures (fig.5-fig.11), we observe that behind the entries of the dictionary, [1], there is a magnetisation curve, BP(4,βH=0), in the Bethe-Peierls approximation with four nearest neighbours, in the absence of external magnetic field, H, with βH=0.
Moreover, the associated correspondance with the Ising model is,

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

and

$$lnk \longleftrightarrow T.$$

k corresponds to temperature in an exponential scale, [27].

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