A Dictionary of the Mikir Language by G. D. Walker and the Graphical law

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Abstract

We study a Dictionary of the Mikir Language by G. D. Walker. 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,$\beta H = 0.02$) i.e. a magnetisation curve for the Bethe-Peierls approximation of the Ising model with four nearest neighbours with $\beta H = 0.02$. β is $\frac{1}{k_B T}$ where, T is temperature, H is external magnetic field and k_B is the Boltzmann constant.

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I. INTRODUCTION

The envelope of hills comes with the name the Mikir Hills. These are group of hills. The tallest among those are of one thousand two hundred meters in altitude. These hills are situated in the southern side of the river Brahmaputra, in the border of two Indian states Assam and Meghalaya. These hills are proximate to Cachar hills of Assam and Khasi-Jaintia Hills of Meghalaya. The people inhibiting those hills refer to themselves as Arleng(meaning man). They are referred to in Assam as the Mikirs. Total number of people is around two lakh twenty thousand. Subsistence farming is their livelihood. Music and dancing is their recreation. Peace is synonymous with their way of living. Here we introduce some words of their language from a Dictionary of the Mikir Language by G. D. Walker, [1].

In the this language, ardom means to worship, ardong means to swim upstream, arlok means channel, arlong means stone, arni means the Sun, day, arni arni means everyday, arni vangring means Sun-rise, arvak means body, arve means rain, asim keme means efficient, ason ason means diverse, avi means likely, badu means all, bakisa means tea-garden, bakos means box, bang means person, bap means grass, barla means rainy season, bata means meadow, batai means time, batai batai means from time to time, batangte means if, beha means business, beheri means forced labour, bervom means to impress, imprint, biri means garden, birlak means lightning, bisas means faith, bithe means everyone, bithi means pan-leaf, bitu means sand-fly, boksi means reward, bong means pumpkin, cup, darling, bonglong means circular, bonglongjir means circle, bongnai means bengali, borva means onlooker, botor means season, bujir means well-constructed, bukburuk means bubble, chamburuso means ghost, cheng means drum, cherdom means welcome, cheri means to gather, cheseroi means epidemic, chethe means life, chevek means to hang, swing, chi means to set(Sun), chiklo means the Moon, month, chiklongso means star, chingki means converse, chiri means bigha, banyan tree, chirnok means weapons, chongho means frog, chu means hair, chung means cool, chung atovar means Milky Way, delong means bridge, dim place place, din means time, ding means long, han means curry, spice, vegetable, hari means straight line, hijai means jackal, homan means equal, ingren means mongoose, ingtui means high, inut means one(person), jak means quantity, jakan means part of floor in Mikir house, jangphong(athe) means jack-fruit, jangrem means satisfied, jangreng means orphan, jir means to stick, jopi means bee, jun means to drink, kai means time, generation, life-time, kai ake means eternity, kaidingde means ephemeral, kan means dance, kar means arrow or, flame, kara means basket kebat means to yoke, kepho means bamboo, khang means obstruct, block, kim means construct, kipi means monkey, kong means wing, kopu(si) means how?, kur means caste, clan, kuru means teacher, kut means inner room of a Mikir house, laha means sealing-wax, lakui means tired, lam means word, lamban means tradition, lamjir means rumour, lang means see, lokhai means husband's father, longku means cave, lum means summit, malom means place, mehek means jungle leaf(used in curry), mej means table, mengkalu means cat, mir means flower, miso means ant, moduram(athe) means guava, moiren means sharp summit, muti means brother, naidung means horizon, nampi means forest, nang means to be necessary, nangho means let us, nihar means wife's mother, nihang means east, ning means mind, herat, ningkan means year, climate, nir means screw, nitur means Sun-light, nothong means unruly, obok means nurse, pan means to clean(jungle etc), panu means ahead, parhi means to fish, patu means to hide, harbour, reserved, phangok(sui) means hot, warm, phi means grand-mother, phule means pot, phulu means bamboo, pijo means honey-bee, pine means anything, pingkhat means order, pinu means aunti, puson means that sort of, like, rai means place, rapsai means mingle, redak means cunning, ri means rope, rit means jhum-field, rong means village, rui means return, sai means work, sang means husked rice, sanglirpi means beetle, se means sound, se kelang means to cure, se kili means shrill, sibu means indigo, somar means children, soroni means key, thai means plain, tomonpi means storm, turhing means light, bright, vai means to pluck(a leaf), vaikang means ellipse, vo means bird, voi means again, vomu is kite, voram is peacock, so on and so forth.

We study magnetic field pattern behind the entries of this dictionary, [1], in this article. 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], respectively.

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 Mikir 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, $\mu N L$, $M_{max} = \mu N$. $\frac{M}{M_{max}} = L$. $\frac{M}{M_{max}}$ is referred to as reduced magnetisation. Moreover, the Ising Hamiltonian,[43], 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, [44], $2\epsilon\gamma\bar{\sigma} + 2H$, where γ is the number of nearest neighbours of a spin. According to Boltzmann principle, $\frac{N_-}{N_+}$ equals $exp(-\frac{\triangle E}{k_B T})$, [45]. In the Bragg-Williams approximation,[46], $\bar{\sigma} = L$, considered in the thermal average sense. Consequently,

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

where, $c = \frac{H}{\gamma\epsilon}$, $T_c = \gamma\epsilon/k_B$, [47]. $\frac{T}{T_c}$ 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 [44]. 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, [43],[44],[45],[46],[47], due to Bethe-Peierls, [48], reduced magnetisation varies with reduced temperature, for γ neighbours, in absence of external magnetic field, as

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

$ln\frac{\gamma}{\gamma-2}$ 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 I. Reduced magnetisation vs reduced temperature datas 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 .

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.

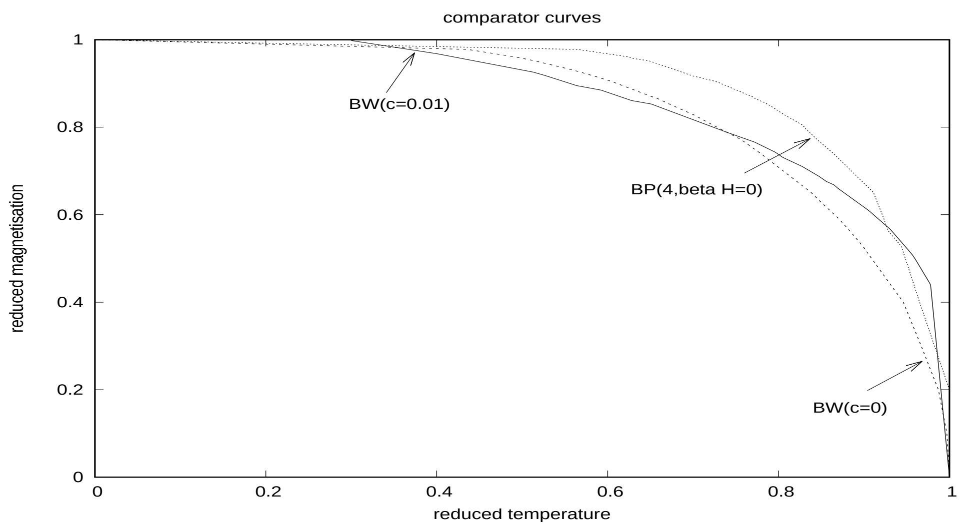

FIG. 1. Reduced magnetisation vs reduced temperature curves for Bragg-Williams approximation, in absence(dark) of and presence(inner in the top) of magnetic field, $c = \frac{H}{\gamma\epsilon} = 0.01$, and Bethe-Peierls approximation in absence of magnetic field, for four nearest neighbours (outer in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

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

In the Bethe-Peierls approximation scheme , [48], 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 [48] 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.

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, [**?**], [**?**], [**?**], [48],

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

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

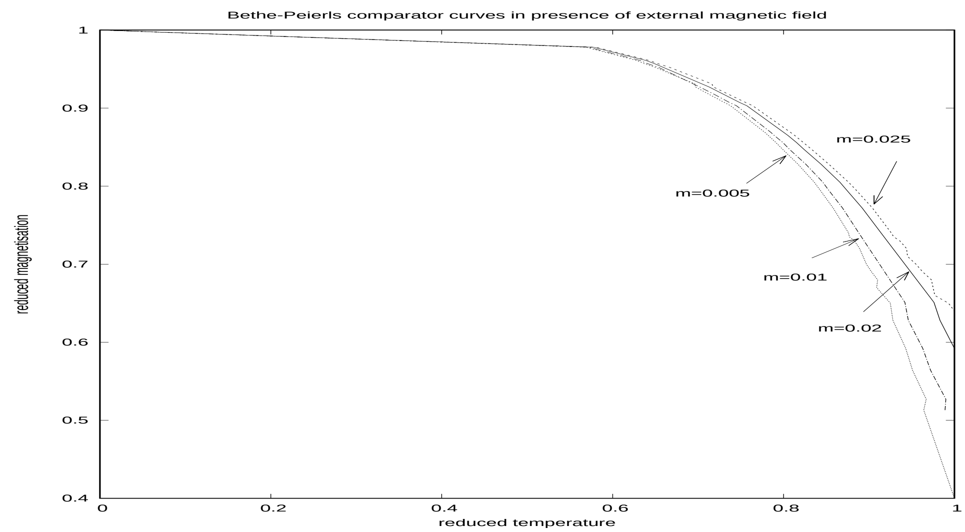

FIG. 2. Reduced magnetisation vs reduced temperature curves for Bethe-Peierls approximation in presence of little external magnetic fields, for four nearest neighbours, with $\beta H = 2m$.

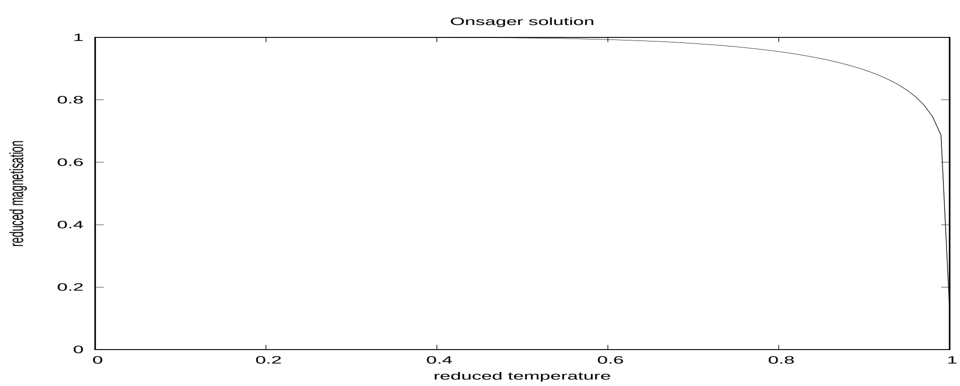

FIG. 3. Reduced magnetisation vs reduced temperature curves for exact solution of two dimensional Ising model, due to Onsager, in absence of external magnetic field

A	B	C	D	E	H	I	J	K	L	M	N	O	P	R	S	T	U	V
465	239	596	148	57	288	304	166	559	263	314	264	58	890	178	268	459	21	145

TABLE III. Mikir words: the first row represents letters of the Mikir alphabet in the serial order, the second row is the respective number of entries

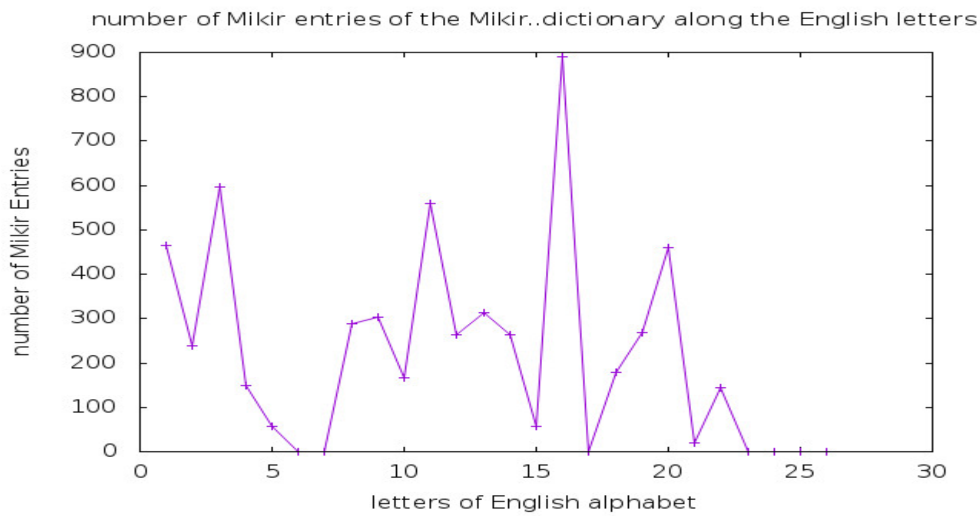

FIG. 4. Vertical axis is number of entries of the Mikir Dictionary,[1]. Horizontal axis is the letters of the English alphabet. Letters are represented by the sequence number in the Englishalphabet.

III. METHOD OF STUDY AND RESULTS

The Mikir language written in English alphabet is composed of nineteen 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, eight hundred ninety, starts with the letter P followed by words numbering five hundred ninety six beginning with C, five hundred fifty nine with the letter K 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, [49], 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 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.

k	lnk	lnk/lnk_{lim}	f	lnf	lnf/lnf_{max}	lnf/lnf_{nmax}	lnf/lnf_{2nmax}	lnf/lnf_{3nmax}	lnf/lnf_{4nmax}	lnf/lnf_{5nmax}	lnf/lnf_{6nmax}
1	0	0	890	6.791	1	Blank	Blank	Blank	Blank	Blank	Blank
2	0.69	0.230	596	6.390	0.941	1	Blank	Blank	Blank	Blank	Blank
3	1.10	0.367	559	6.326	0.932	0.990	1	Blank	Blank	Blank	Blank
4	1.39	0.463	465	6.142	0.904	0.961	0.971	1	Blank	Blank	Blank
5	1.61	0.537	459	6.129	0.903	0.959	0.969	0.998	1	Blank	Blank
6	1.79	0.597	314	5.749	0.847	0.900	0.909	0.936	0.938	1	Blank
7	1.95	0.650	304	5.717	0.842	0.895	0.904	0.931	0.933	0.994	1
8	2.08	0.693	288	5.663	0.834	0.886	0.895	0.922	0.924	0.985	0.991
9	2.20	0.733	268	5.591	0.823	0.875	0.884	0.910	0.912	0.973	0.978
10	2.30	0.767	264	5.576	0.821	0.873	0.881	0.908	0.910	0.970	0.975
11	2.40	0.800	263	5.572	0.820	0.872	0.881	0.907	0.909	0.969	0.975
12	2.48	0.827	239	5.476	0.806	0.857	0.866	0.891	0.893	0.953	0.958
13	2.56	0.853	178	5.182	0.763	0.811	0.819	0.844	0.845	0.901	0.906
14	2.64	0.880	166	5.112	0.753	0.800	0.808	0.832	0.834	0.889	0.894
15	2.71	0.903	148	4.997	0.736	0.782	0.790	0.814	0.815	0.869	0.874
16	2.77	0.923	145	4.977	0.733	0.779	0.787	0.810	0.812	0.866	0.871
17	2.83	0.943	58	4.060	0.598	0.635	0.642	0.661	0.662	0.706	0.710
18	2.89	0.963	57	4.043	0.595	0.633	0.639	0.658	0.660	0.703	0.707
19	2.94	0.980	21	3.045	0.448	0.477	0.481	0.496	0.497	0.530	0.533
20	3.00	1	1	0	0	0	0	0	0	0	0

TABLE IV. Mikir words: ranking, natural logarithm, normalisations

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_{6n-max} we record in the adjoining table, IV.

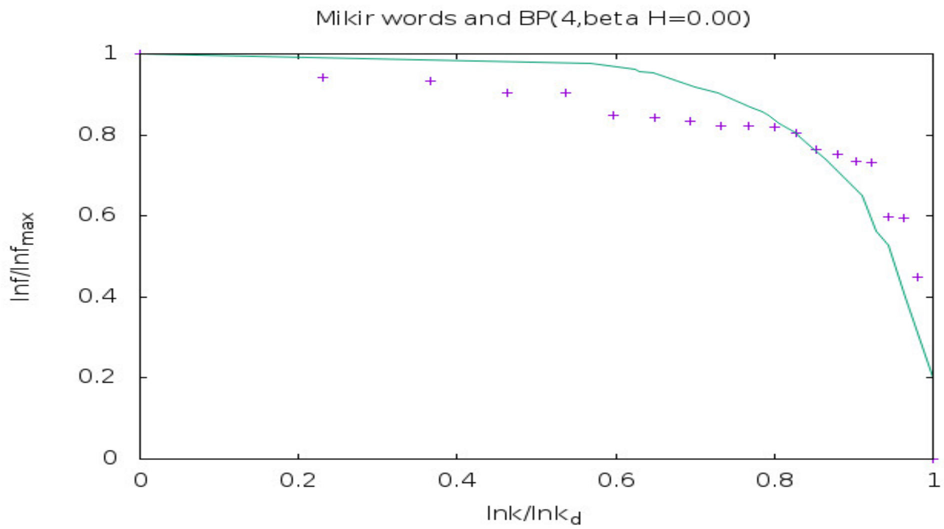

FIG. 5. Vertical axis is $\frac{lnf}{lnf_{max}}$ and horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the entries of the Mikir language with the fit curve being Bethe-Peierls curve in presence of four nearest neighbours and in absence of external magnetic field i.e., $m = 0.00$ or, $\beta H = 0.00$.

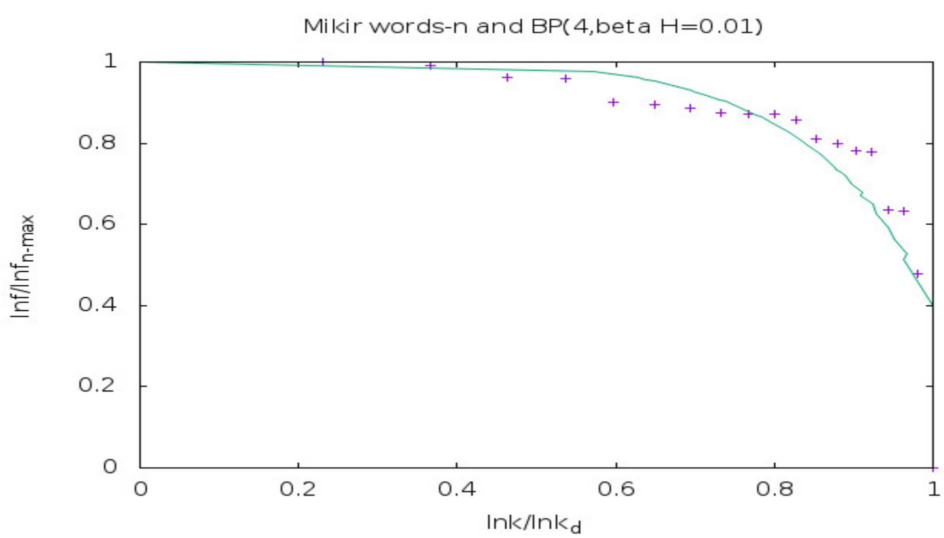

FIG. 6. Vertical axis is $\frac{lnf}{lnf_{next-max}}$ and horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the entries of the Mikir language with the fit curve being Bethe-Peierls curve in presence of four nearest neighbours and little magnetic field, $m = 0.005$ or, $\beta H = 0.01$.

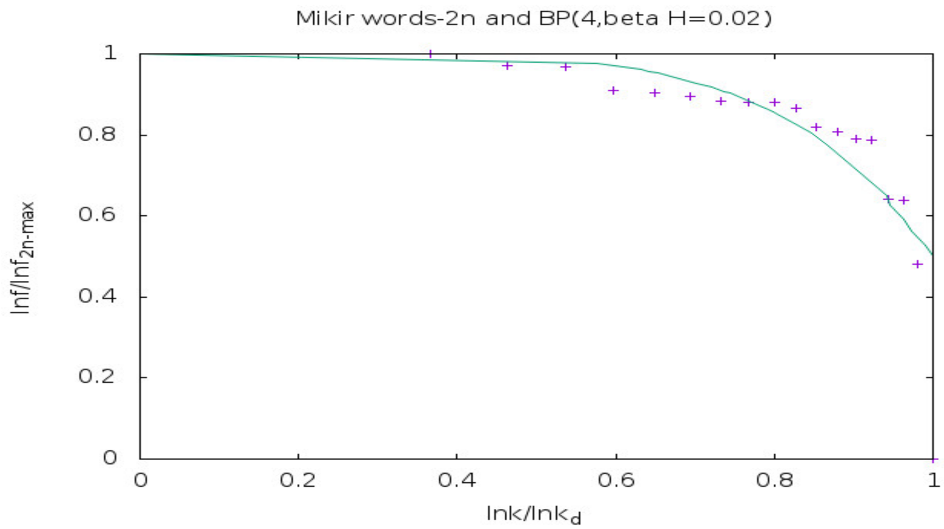

FIG. 7. Vertical axis is $\frac{lnf}{lnf_{nn-max}}$ and horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the entries of the Mikir language with the fit curve being Bethe-Peierls curve in presence of four nearest neighbours and little magnetic field, $m = 0.01$ or, $\beta H = 0.02$.

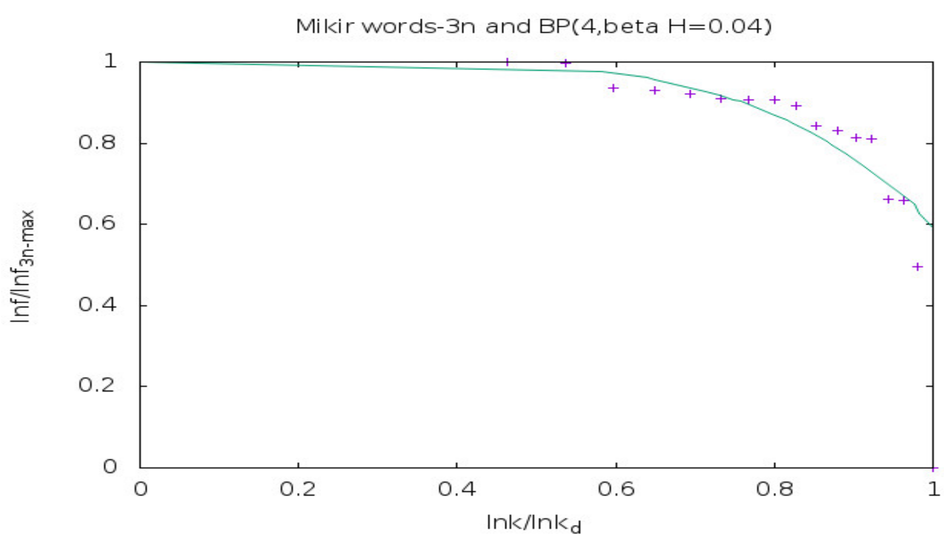

FIG. 8. Vertical axis is $\frac{lnf}{lnf_{nnn-max}}$ and horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the entries of the Mikir language with the fit curve being Bethe-Peierls curve in presence of four nearest neighbours and little magnetic field, $m = 0.02$ or, $\beta H = 0.04$.

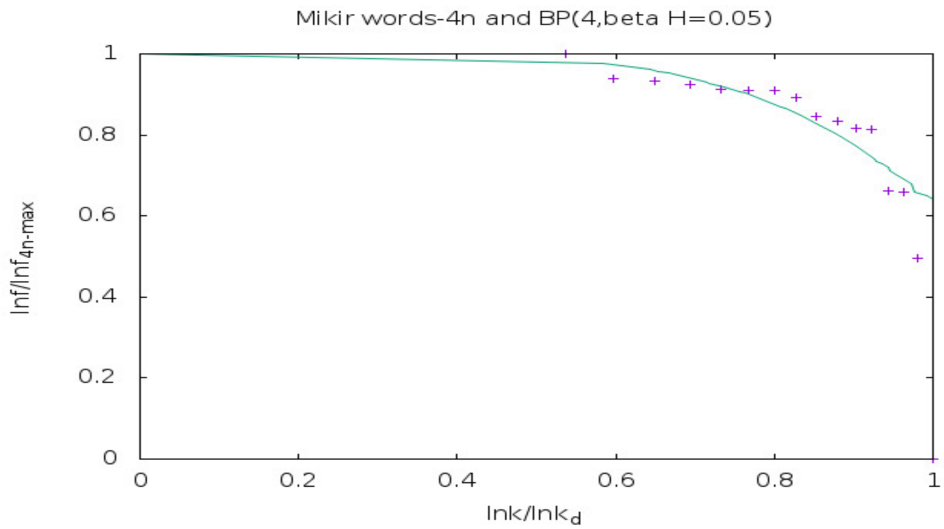

FIG. 9. Vertical axis is $\frac{lnf}{lnf_{nnnn-max}}$ and horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the entries of the Mikir language with the fit curve being Bethe-Peierls curve in presence of four nearest neighbours and little magnetic field, $m = 0.025$ or, $\beta H = 0.05$.

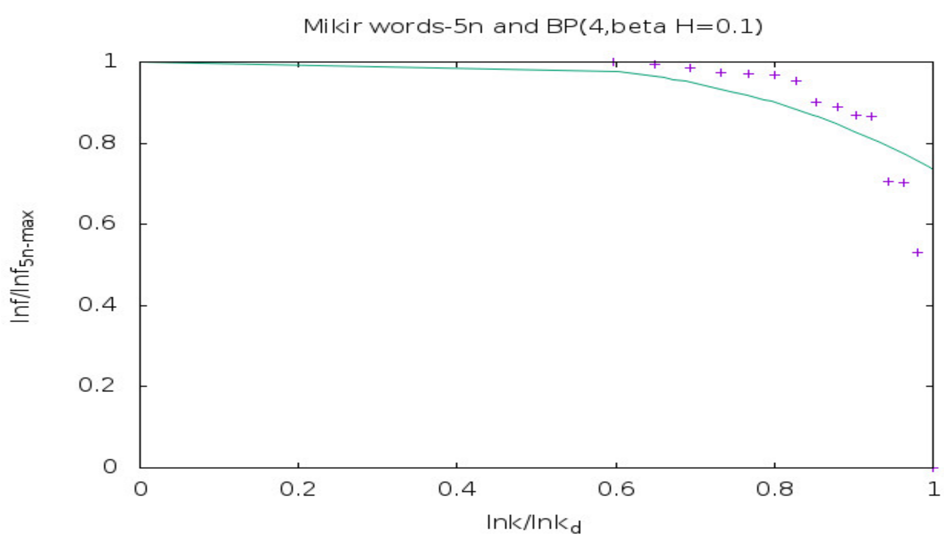

FIG. 10. Vertical axis is $\frac{lnf}{lnf_{nnnnn-max}}$ and horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the entries of the Mikir language with the fit curve being Bethe-Peierls curve in presence of four nearest neighbours and little magnetic field, $m = 0.05$ or, $\beta H = 0.1$.

A. conclusion

From the figures (fig.5-fig.10), we observe that behind the entries of the dictionary, [1], there is a magnetisation curve, BP(4,$\beta H = 0.02$), in the Bethe-Peierls approximation with four nearest neighbours, in presence of liitle magnetic field, $\beta H = 0.02$.
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, [50]. As temperature decreases, i.e. lnk decreases, f increases. The letters which are recording higher entries compared to those which have lesser entries are at lower temperature. As the Mikir language expands, the letters which get enriched more and more, fall at lower and lower temperatures. This is a manifestation of cooling effect as was first observed in [51] in another way.

B. Discussion

To look for Onsager core, we draw the figures (fig.11-fig.17). We notice in the figure (fig.16), that but for the entries of the letters E, O, U, the other points fall on the Onsager line. Moreover, to find any similarity with the Garo language, if any, we plot frequencies for both the Mikir entries, [1] and the Garo entries from the Garo to English School Dictionary, [52], in the figure(fig.18) and leave to the readers. Moreover, the dictionary, [1], we have studied here was written almost hundred years back. It is desirable to have a contemporary dictionary on the Mikir Language to have the preceeding analysis carried through.

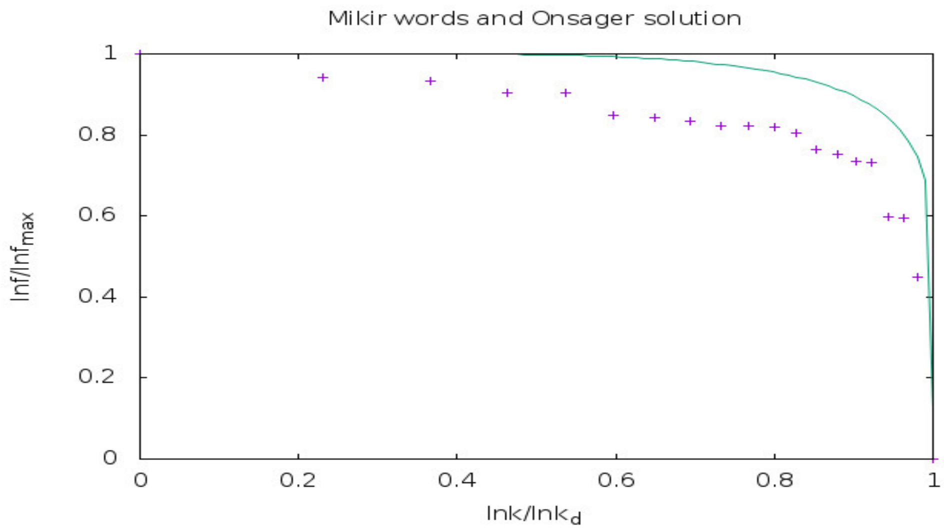

FIG. 11. Vertical axis is $\frac{lnf}{lnf_{max}}$ and horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the entries of the Mikir language. The uppermost curve is the Onsager solution.

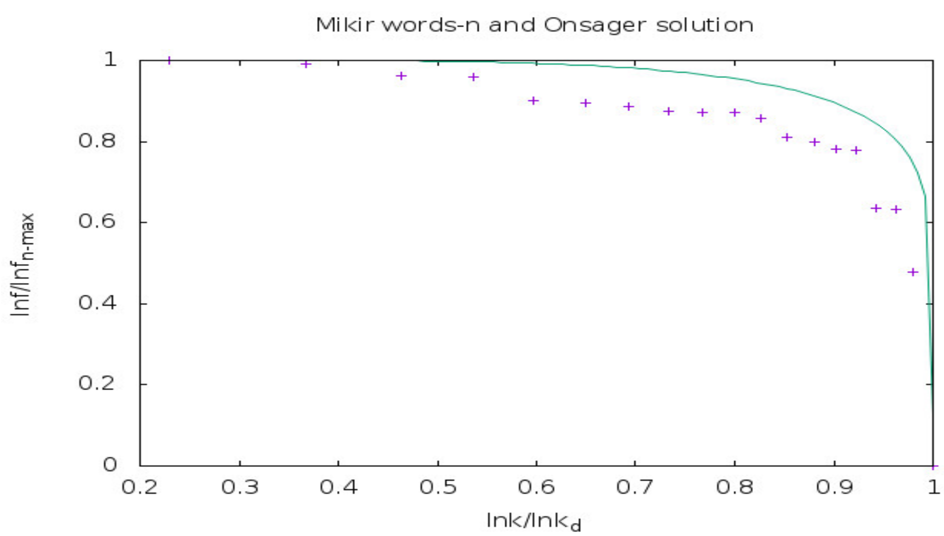

FIG. 12. Vertical axis is $\frac{lnf}{lnf_{nmax}}$ and horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the entries of the Mikir language. The uppermost curve is the Onsager solution.

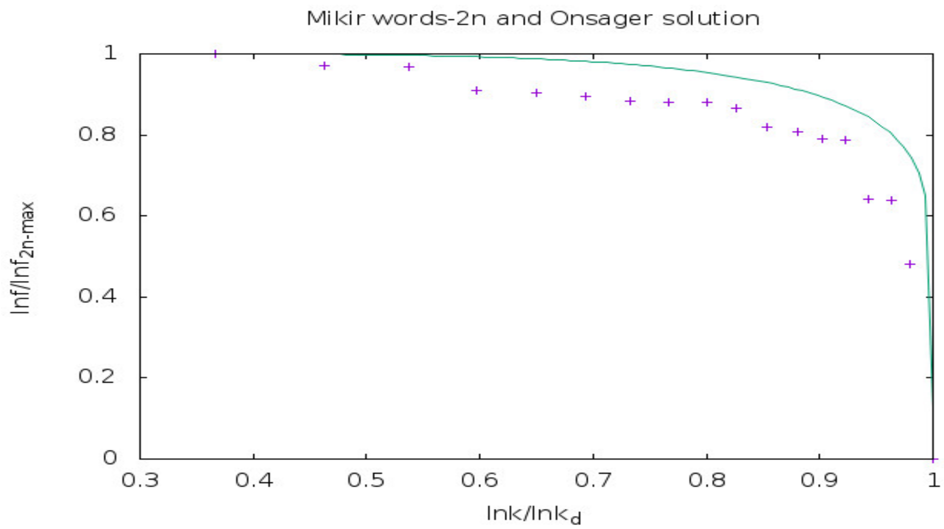

FIG. 13. Vertical axis is $\frac{lnf}{lnf_{2n-max}}$ and horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the entries of the Mikir language. The uppermost curve is the Onsager solution.

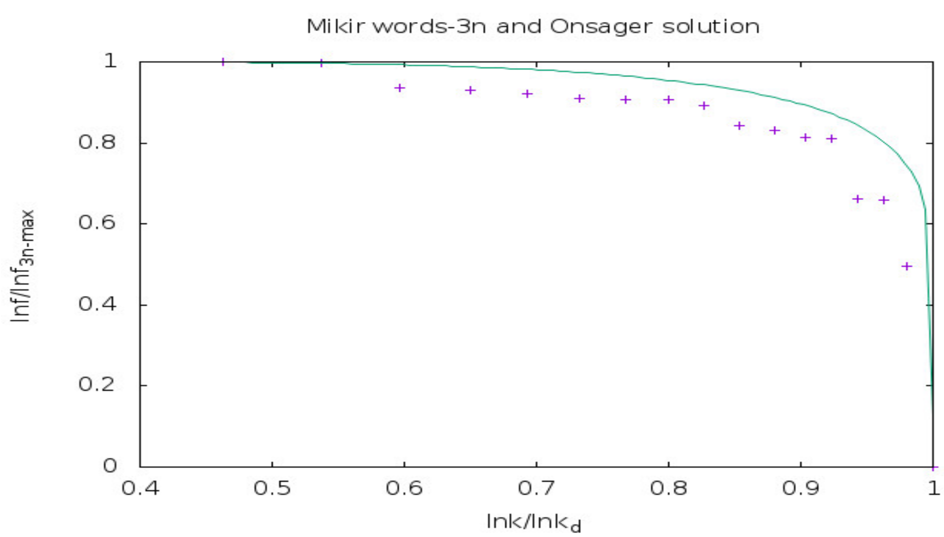

FIG. 14. Vertical axis is $\frac{lnf}{lnf_{3n-max}}$ and horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the entries of the Mikir language. The uppermost curve is the Onsager solution.

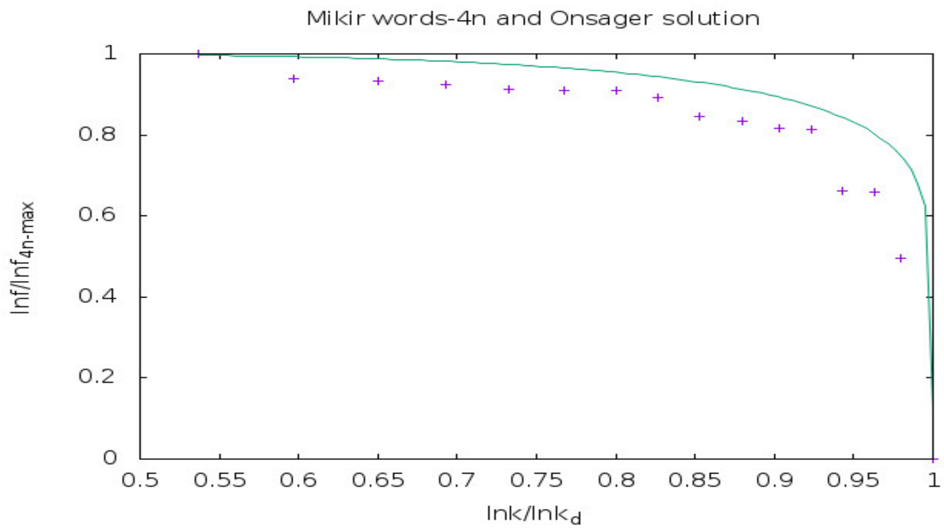

FIG. 15. Vertical axis is $\frac{lnf}{lnf_{4n-max}}$ and horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the entries of the Mikir language. The uppermost curve is the Onsager solution.

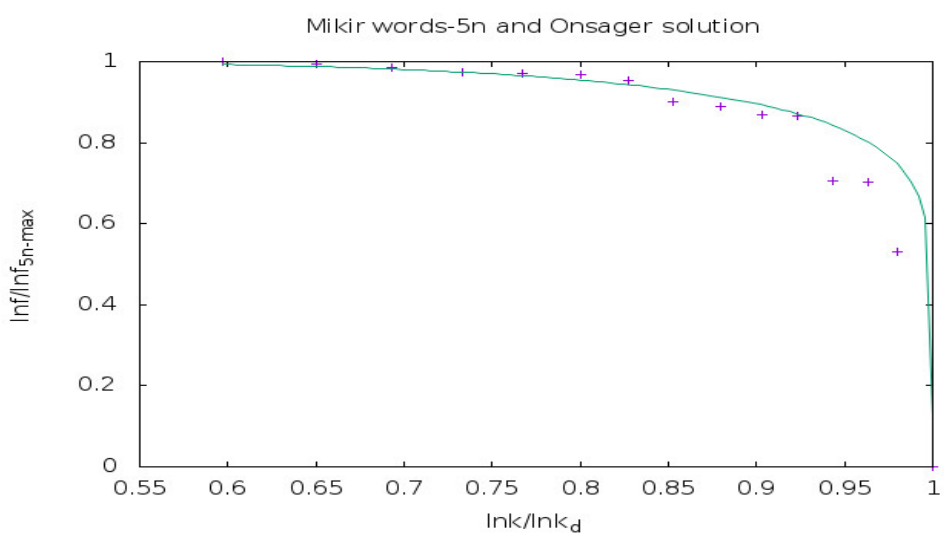

FIG. 16. Vertical axis is $\frac{lnf}{lnf_{5n-max}}$ and horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the entries of the Mikir language. The uppermost curve is the Onsager solution.

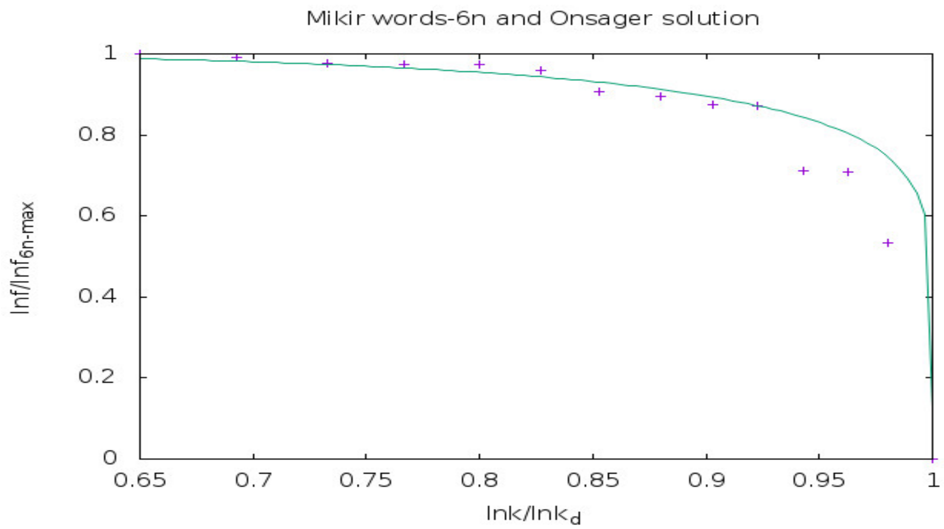

FIG. 17. Vertical axis is $\frac{lnf}{lnf_{6n-max}}$ and horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the entries of the Mikir language. The uppermost curve is the Onsager solution.

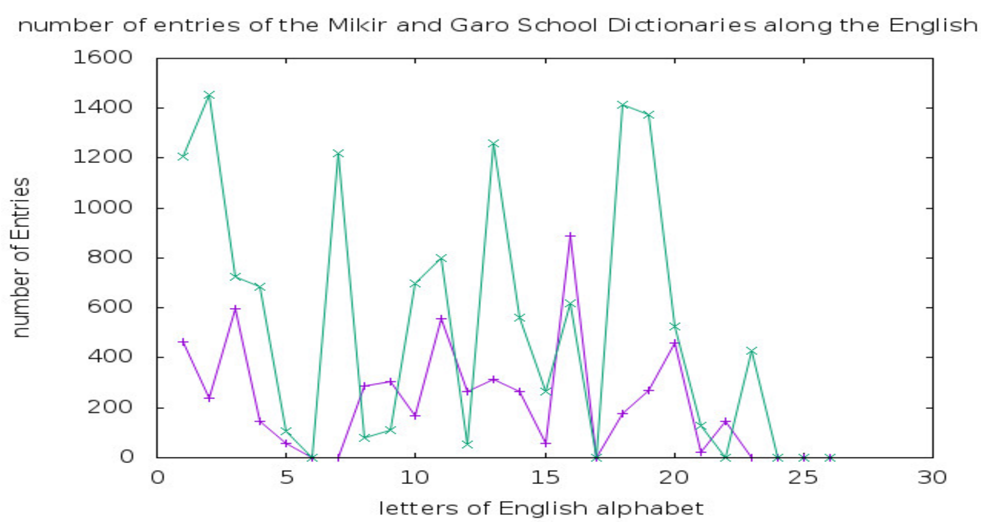

FIG. 18. Vertical axis is number of entries. The lower pointsline is of the Mikir Dictionary,[1] and the higher pointsline is of the Garo to English School Dictionary, [52]. Horizontal axis is the letters of the English alphabet. Letters are represented by the sequence number in the English alphabet.

IV. ACKNOWLEDGMENT

We have used gnu plot for drawing the figures. The author would like to thank the nehu library for allowing him to use the Mikir Dictionary,[1]. We have benefited by reading related web pages from WWW.encyclopedia.com.

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