Langenscheidt's Pocket Chinese Dictionary and The Graphical Law

Anindya Kumar Biswas*

Department of Physics;

North-Eastern Hill University,

Mawkynroh-Umshing, Shillong-793022.

(Dated: March 1, 2024)

Abstract

We study the Chinese head entries of the Langenscheidt's Pocket Chinese Dictionary written in Pinyin, a Romanized pronunciation system. We draw the natural logarithm of the number of head entries, normalised, starting with a letter vs the natural logarithm of the rank of the letter, normalised(unnormalised). We find that the head entries underlie a magnetisation curve of a Spin-Glass in the presence of little external magnetic field.

* anindya@nehu.ac.in

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
132	1057	1164	1201	66	717	904	896	0	1476	466	736	604	378	15	445	672	273	1566	860	1	0	621	1124	1343	1540

TABLE I. Chinese head entries of Langenscheidt's Pocket Chinese Dictionary,[2]

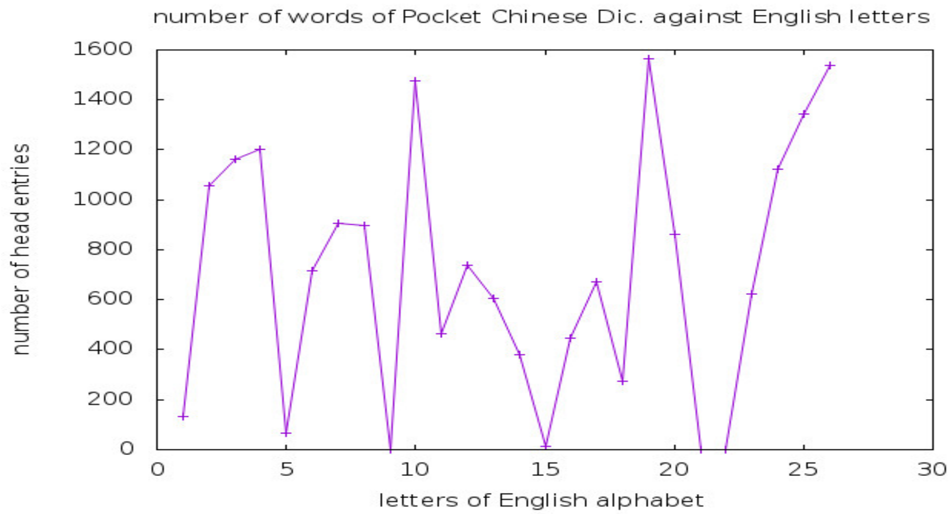

FIG. 1. The vertical axis is number of head entries in the Langenscheidt's Pocket Chinese Dictionary,[2]. The horizontal axis is the letters of the English alphabet. Letters are represented by the sequence number in the alphabet.

I. INTRODUCTION

China and Japan are two neighbouring countries. In our previous paper, [1], we have found that the Japanese language underlies the Onsager's solution, in a Romanised Pronunciation system. What about the Chinese language? Answer to it is that the Chinese language does not underlie the Onsager's solution, in a Romanised Pronunciation system called Pinyin. Rather the Chinese language underlies a Spin-Glass magnetisation curve. The rest of the paper is along the details.

We count all the Chinese head entries, [2], one by one, beginning with each letter. The result is the table, tableI. To visualise we plot the number of head entries, [2], against the letters of the English alphabet, in the adjoining figure, fig.1.

Looking for the Graphical Law in this dictionary, we proceed narrating the development. We have started considering magnetic field pattern in [3], in the languages we converse with. We have studied there, a set of natural languages, [3] 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, [4], 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 in references from [5] to [69]. The latest one is the reference, [1].

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 the Graphical Law analysis of the Chinese head entries of the Langenscheidt's Pocket Chinese Dictionary, [2]. Section IV is Acknowledgment. The last section is Bibliography.

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 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, μNL, $M_{max} = \mu N$. $\frac{M}{M_{max}} = L$. $\frac{M}{M_{max}}$ is referred to as reduced magnetisation. Moreover, the Ising Hamiltonian,[71], 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, [72], $2\epsilon\gamma\bar{\sigma} + 2H$, where γ is the number of nearest neighbours of a spin. According to Boltzmann principle, $\frac{N_-}{N_+}$ equals $exp(-\frac{\triangle E}{k_B T})$, [73]. In the Bragg-Williams approximation,[74], $\bar{\sigma} = L$, 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, $c = \frac{H}{\gamma\epsilon}$, $T_c = \gamma\epsilon/k_B$, [75]. $\frac{T}{T_c}$ 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 [72]. 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.

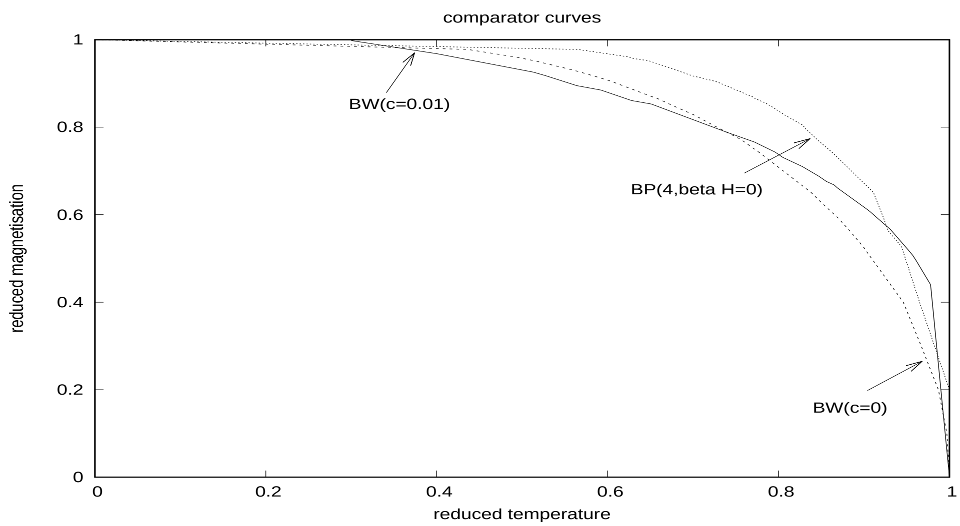

FIG. 2. Reduced magnetisation vs reduced temperature curves for Bragg-Williams approximation, in absence(dark) of and presence(inner in the top) of magnetic field, $c = \frac{H}{\gamma\epsilon} = 0.01$, and Bethe-Peierls approximation in absence of magnetic field, for four nearest neighbours (outer in the top).

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, [71],[72],[73],[74],[75], due to Bethe-Peierls, [76], 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 data s generated from the equation(1) and the equation(2) in the table, II, 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.2. Empty spaces in the table, II, mean corresponding point pairs were not used for plotting a line.

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 II. 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 .

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

In the Bethe-Peierls approximation scheme , [76], 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 [76] is given in the appendix of [8].

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

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

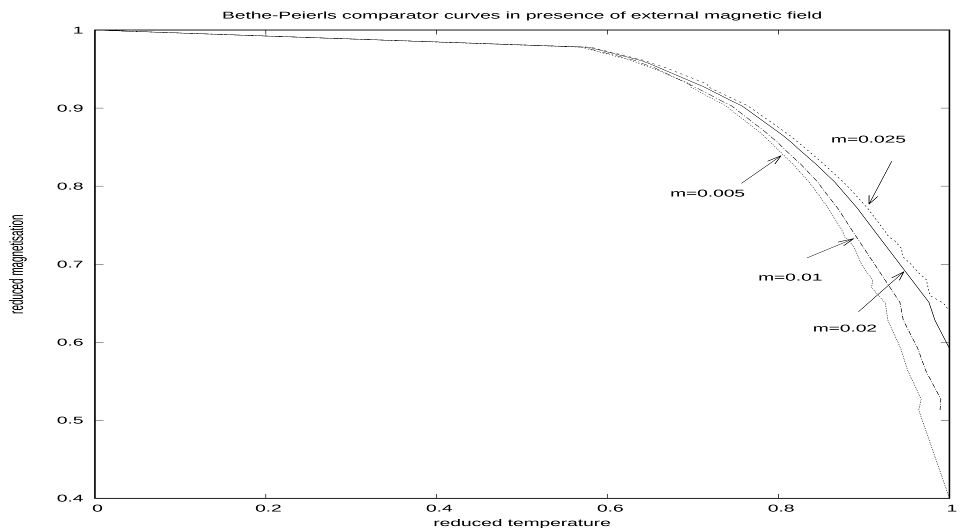

FIG. 3. Reduced magnetisation vs reduced temperature curves for Bethe-Peierls approximation in presence of little external magnetic fields, for four nearest neighbours, with $\beta H = 2m$.

In the following, we describe data s in the table, III, generated from the equation(4) and curves of magnetisation plotted on the basis of those data s. 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.3. Similarly, we plot fig.4. Empty spaces in the table, III, 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 III. Bethe-Peierls approx. in presence of little external magnetic fields

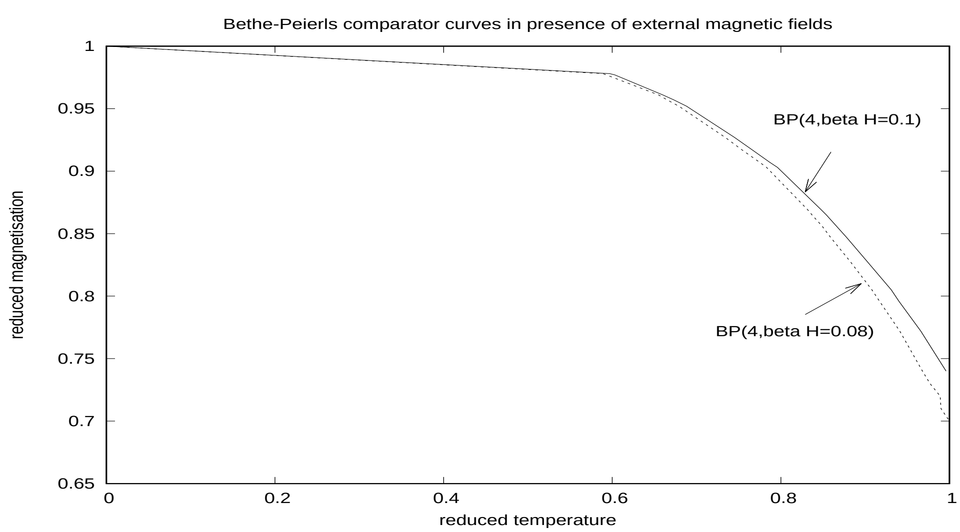

FIG. 4. Reduced magnetisation vs reduced temperature curves for Bethe-Peierls approximation in presence of little external magnetic fields, for four nearest neighbours, with $\beta H = 2m$.

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, [77], [78], [79], [76],

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

Graphically, the Onsager solution appears as in fig.5.

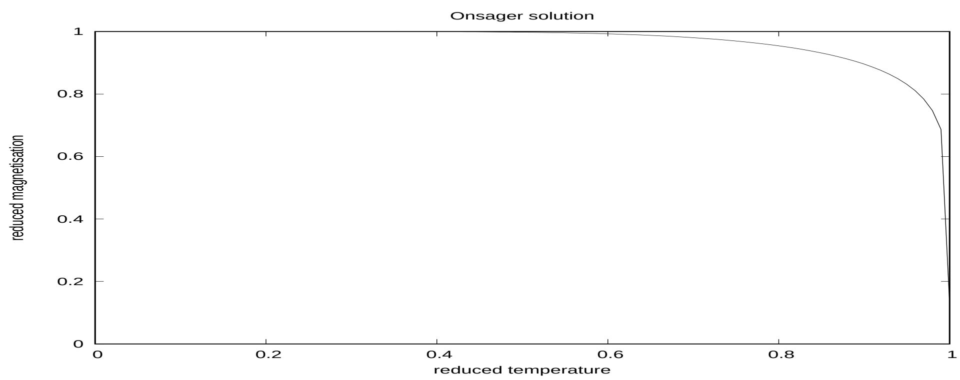

FIG. 5. Reduced magnetisation vs reduced temperature curves for exact solution of two dimensional Ising model, due to Onsager, in absence of external magnetic field

E. Spin-Glass

In the case coupling between(among) the spins, not necessarily n.n, for the Ising model is(are) random, we get Spin-Glass. When a lattice of spins randomly coupled and in an external magnetic field, goes over to the Spin-Glass phase, magnetisation increases steeply like $\frac{1}{T-T_c}$ i.e. like the branch of rectangular hyperbola, up to the the phase transition temperature, followed by very little increase,[80–82], in magnetisation, as the ambient temperature continues to drop.

Theoretical study of Spin Glass started with the paper by Edwards, Anderson,[83]. They were trying to explain two experimental results concerning continuous disordered freezing(phase transition) and sharp cusp in static magnetic susceptibility. This was followed by a paper by Sherrington, Kickpatrick, [84], who dealt with Ising model with interactions being present among all neighbours. The interaction is random, follows Gaussian distribution and does not distinguish one pair of neighbours from another pair of neighbours, irrespective of the distance between two neighbours. In presence of external magnetic field, they predicted in their next paper, [85], below spin-glass transition temperature a spin-glass phase with non-zero magnetisation. Almeida etal, [86], Gray and Moore, [87],finally Parisi, [88], [89] improved and gave final touch, [90], to their line of work. Parisi and collaborators, [91]-[95], wrote a series of papers in postscript, all revolving around a consistent assumption of constant magnetisation in the spin-glass phase in presence of little constant external magnetic field.

In another sequence of theoretical work, by Fisher etal,[96–98], concluded that for Ising model with nearest neighbour or, short range interaction of random type spin-glass phase does not exist in presence of external magnetic field.

For recent series of experiments on spin-glass, the references, [99, 100], are the places to look into.

For an in depth account, accessible to a commoner, the series of articles by late P. W. Anderson in Physics Today, [101]-[107], is probably the best place to look into. For a book to enter into the subject of spin-glass, one may start at [108].

Here, in our work to follow, spin-glass refers to spin-glass phase of a system with infinite range random interactions.

III. THE GRAPHICAL LAW ANALYSIS

For the purpose of exploring graphical law, we assort the letters according to the number of head entries, in the descending order, denoted by f and the respective rank, [70], denoted by k. k is a positive integer starting from one. Moreover, minimum number of head entries is one. The limiting rank is maximum rank, here it is twenty four. 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.6. We then ignore the letter with the highest number of head entries, tabulate in the adjoining table,IV,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,IV, 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,IV, and plot starting from $k=4$ in the figure fig.9. In this way we obtain up to the figure fig.12.

k	lnk	lnk/lnk_{lim}	f	lnf	lnf/lnf_{max}	lnf/$lnf_{next-max}$	lnf/lnf_{2nmax}	lnf/lnf_{3nmax}	lnf/lnf_{4nmax}	lnf/lnf_{5nmax}
1	0	0	1566	7.356	1	Blank	Blank	Blank	Blank	Blank
2	0.69	0.217	1540	7.340	0.998	1	Blank	Blank	Blank	Blank
3	1.10	0.346	1476	7.297	0.992	0.994	1	Blank	Blank	Blank
4	1.39	0.437	1343	7.203	0.979	0.981	0.987	1	Blank	Blank
5	1.61	0.506	1201	7.091	0.964	0.966	0.972	0.984	1	Blank
6	1.79	0.563	1164	7.060	0.960	0.962	0.968	0.980	0.996	1
7	1.95	0.613	1124	7.025	0.955	0.957	0.963	0.975	0.991	0.995
8	2.08	0.654	1057	6.963	0.947	0.949	0.954	0.967	0.982	0.986
9	2.20	0.692	904	6.807	0.925	0.927	0.933	0.945	0.960	0.964
10	2.30	0.723	896	6.798	0.924	0.926	0.932	0.944	0.959	0.963
11	2.40	0.755	860	6.757	0.919	0.921	0.926	0.938	0.953	0.957
12	2.48	0.780	736	6.601	0.897	0.899	0.905	0.916	0.931	0.935
13	2.56	0.805	717	6.575	0.894	0.896	0.901	0.913	0.927	0.931
14	2.64	0.830	672	6.510	0.885	0.887	0.892	0.904	0.918	0.922
15	2.71	0.852	621	6.431	0.874	0.876	0.881	0.893	0.907	0.911
16	2.77	0.871	604	6.404	0.871	0.872	0.878	0.889	0.903	0.907
17	2.83	0.890	466	6.144	0.835	0.837	0.842	0.853	0.866	0.870
18	2.89	0.909	445	6.098	0.829	0.831	0.836	0.847	0.860	0.864
19	2.94	0.925	378	5.935	0.807	0.809	0.813	0.824	0.837	0.841
20	3.00	0.943	273	5.609	0.763	0.764	0.769	0.779	0.791	0.794
21	3.04	0.956	132	4.883	0.664	0.665	0.669	0.678	0.689	0.692
22	3.09	0.972	66	4.190	0.570	0.571	0.574	0.582	0.591	0.593
23	3.14	0.987	15	2.708	0.368	0.369	0.371	0.376	0.382	0.384
24	3.18	1	1	0	0	0	0	0	0	0

TABLE IV. Head entries of the Langenscheidt's Pocket Chinese dictionary: ranking, natural logarithms, normalisations

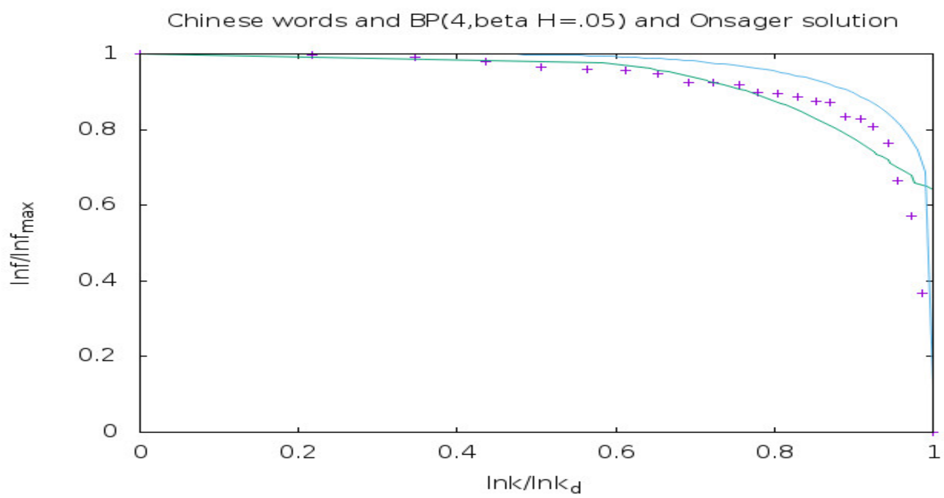

FIG. 6. The vertical axis is $\frac{lnf}{lnf_{max}}$ and the horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the head entries of the Langenscheidt's Pocket Chinese Dictionary, with the fit curve BP(4,$\beta H = 0.05$), being the Bethe-Peierls curve with four nearest neighbours, in presence of little magnetic field, m=0.025 or, $\beta H = 0.05$. The uppermost curve is the Onsager solution.

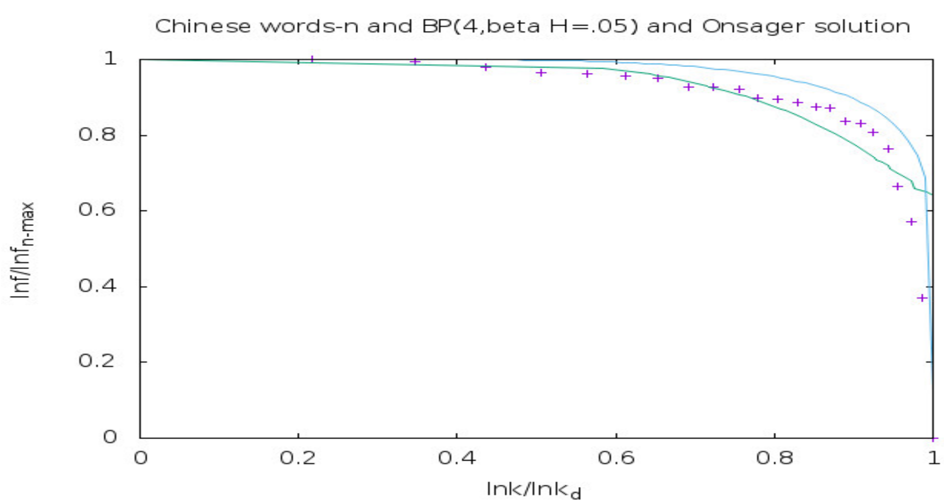

FIG. 7. The vertical axis is $\frac{lnf}{lnf_{n-max}}$ and the horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the head entries of the Langenscheidt's Pocket Chinese Dictionary, with the fit curve BP(4,$\beta H = 0.05$), being the Bethe-Peierls curve with four nearest neighbours, in presence of little magnetic field, m=0.025 or, $\beta H = 0.05$. The uppermost curve is the Onsager solution.

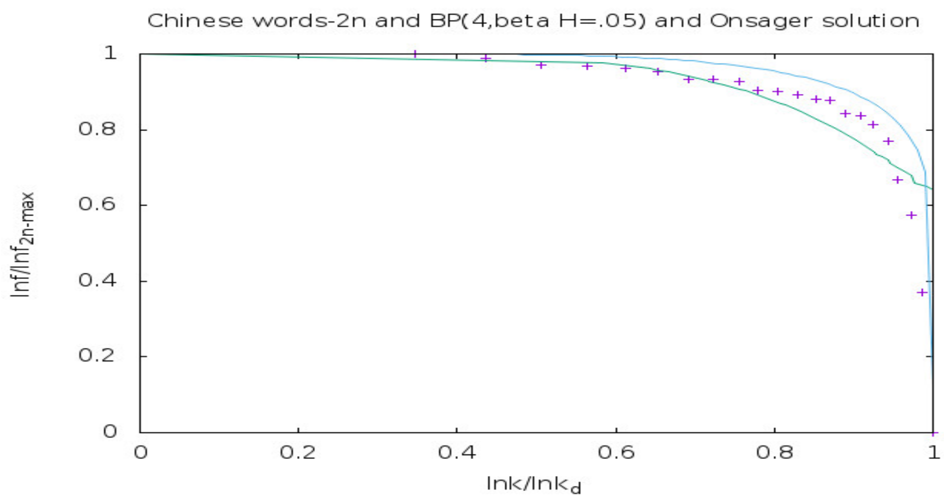

FIG. 8. The vertical axis is $\frac{lnf}{lnf_{2n-max}}$ and the horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the head entries of the Langenscheidt's Pocket Chinese Dictionary, with the fit curve, BP(4,$\beta H = 0.05$), being the Bethe-Peierls curve with four nearest neighbours, in presence of little magnetic field, m=0.025 or, $\beta H = 0.05$. The uppermost curve is the Onsager solution.

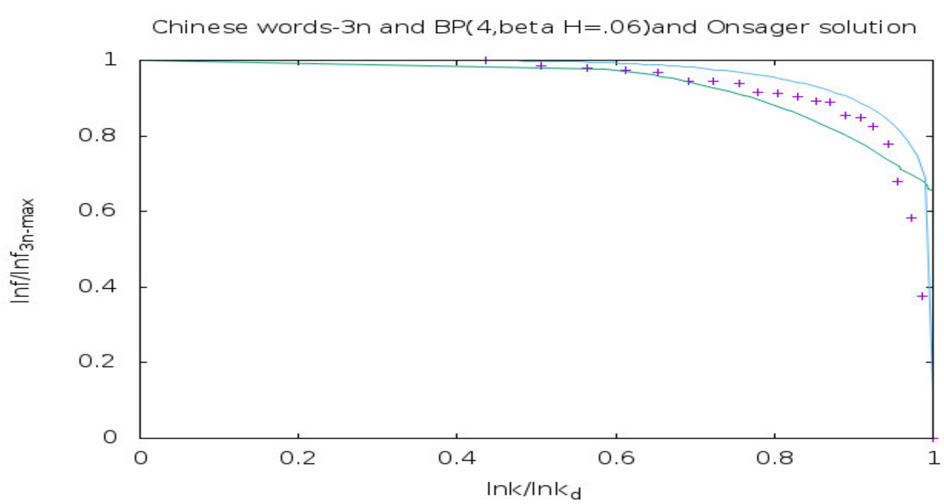

FIG. 9. The vertical axis is $\frac{lnf}{lnf_{3n-max}}$ and the horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the head entries of the Langenscheidt's Pocket Chinese Dictionary, with the fit curve, BP(4,$\beta H = 0.06$), being the Bethe-Peierls curve with four nearest neighbours, in presence of little magnetic field, m=0.03 or, $\beta H = 0.03$. The uppermost curve is the Onsager solution.

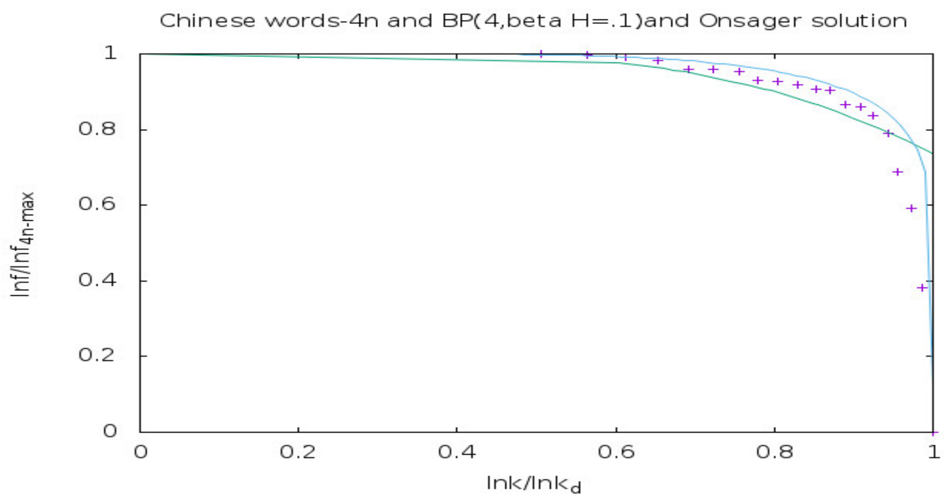

FIG. 10. The vertical axis is $\frac{lnf}{lnf_{4n-max}}$ and the horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the head entries of the Langenscheidt's Pocket Chinese Dictionary, with the fit curve, BP(4,$\beta H = 0.1$), being the Bethe-Peierls curve with four nearest neighbours, in presence of little magnetic field, m=0.05 or, $\beta H = 0.05$. The uppermost curve is the Onsager solution.

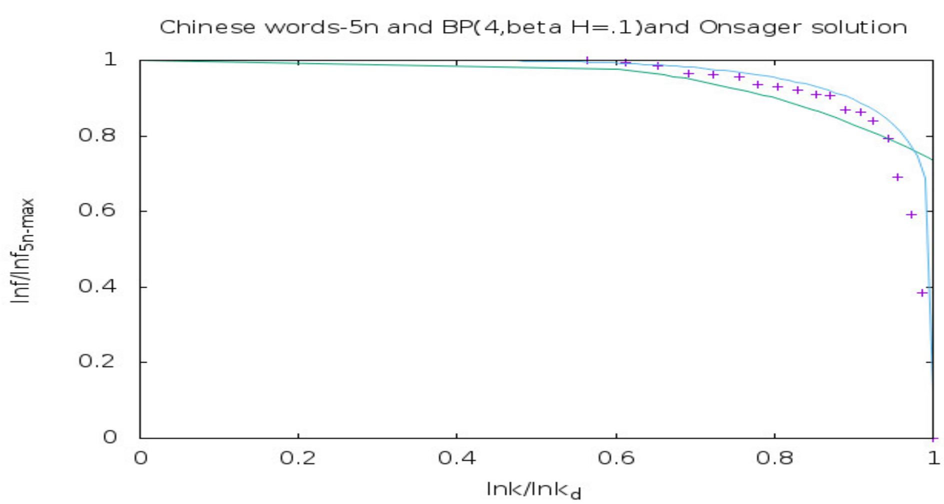

FIG. 11. The vertical axis is $\frac{lnf}{lnf_{5n-max}}$ and the horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the head entries of the Langenscheidt's Pocket Chinese Dictionary, with the fit curve, BP(4,$\beta H = 0.1$), being the Bethe-Peierls curve with four nearest neighbours, in presence of little magnetic field, m=0.05 or, $\beta H = 0.05$. The uppermost curve is the Onsager solution.

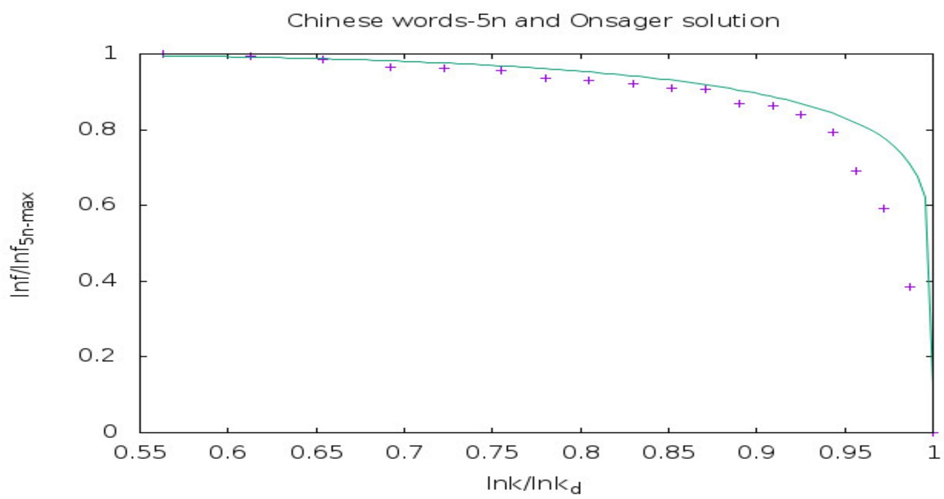

FIG. 12. The vertical axis is $\frac{lnf}{lnf_{5n-max}}$ and the horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the head entries of the Langenscheidt's Pocket Chinese Dictionary, with the reference curve being the Onsager solution.

A. tentative conclusion

Matching of the plots in the figures fig.(6-12), with comparator curves i.e. the magnetisation curves of Bethe-Peierls approximations, is with dispersion and dispersion does not reduce over higher orders of normalisations. On the top of it, on successive higher normalisations, the head entries of the Langenscheidt's Pocket Chinese Dictionary,[2], do not go over to Onsager solution in the normalised lnf vs $\frac{lnk}{lnk_{lim}}$ graphs.

To explore for possible existence of spin-glass transition, in presence of little external magnetic field, $\frac{lnf}{lnf_{rn-max}}$ are drawn against lnk in the figures fig.13-fig.15, where r varies from zero to two.

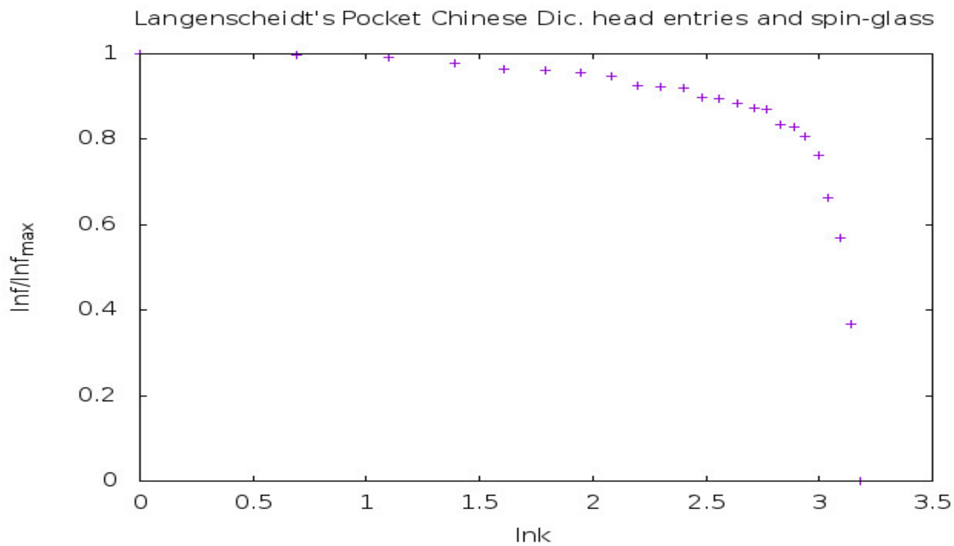

FIG. 13. The vertical axis is $\frac{lnf}{lnf_{max}}$ and the horizontal axis is lnk. The + points represent the head entries of the Langenscheidt's Pocket Chinese Dictionary,[2].

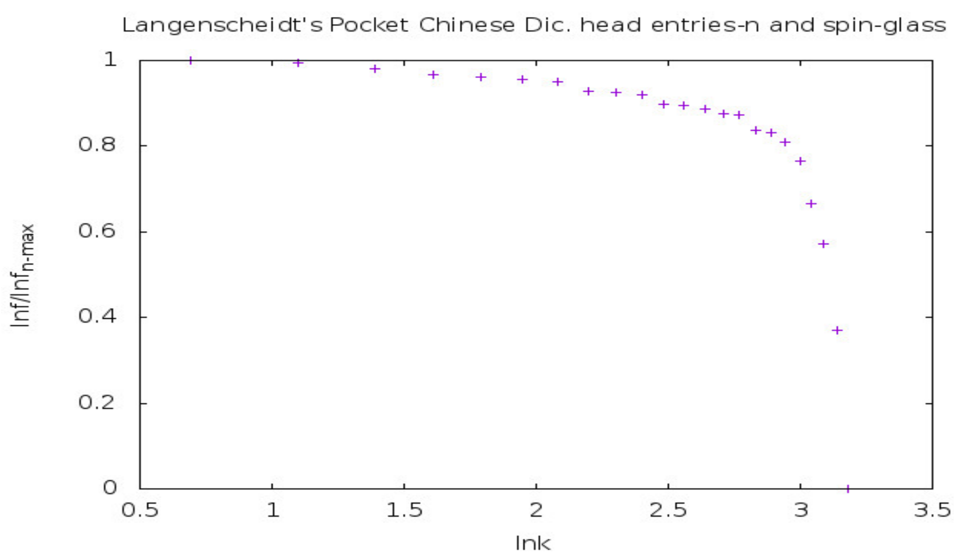

FIG. 14. The vertical axis is $\frac{lnf}{lnf_{n-max}}$ and the horizontal axis is lnk. The + points represent the head entries of the Langenscheidt's Pocket Chinese Dictionary,[2].

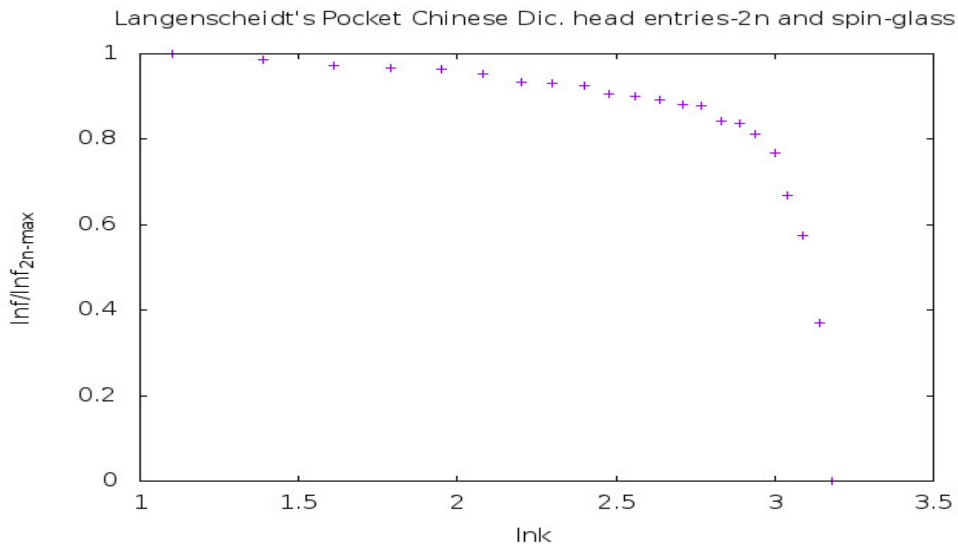

FIG. 15. The vertical axis is $\frac{lnf}{lnf_{2n-max}}$ and the horizontal axis is lnk. The + points represent the head entries of the Langenscheidt's Pocket Chinese Dictionary,[2].

B. conclusion

In the figures Fig.13-Fig.15, the points has a smoothed transition, [95]. Above the transition point(s), the lines are almost horizontal and below the transition point(s), points-line rises straight. Hence, the head entries of the Langenscheidt's Pocket Chinese Dictionary,[2], is suited to be described by a Spin-Glass magnetisation curve, [80], in the presence of little external magnetic field.

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, [109].

IV. ACKNOWLEDGMENT

We have used gnuplot for plotting the figures in this paper.

[1] Anindya Kumar Biswas, "The Langenscheidt's Pocket Japanese Dictionary and the Onsager's solution", viXra:2402.0052[Condensed Matter]

[2] Langenscheidt's Pocket Chinese Dictionary, Chinese-English English-Chinese, Edited by the Langenscheidt Editorial Staff, General Editor: Peter Terrell, 2010 Reprint, Published by W. R. Goyal Publishers and Distributors, 86, U.B. Jawahar Nagar, Delhi-110007(India); ISBN: 81-8307-242-7.

[3] Anindya Kumar Biswas, "Graphical Law beneath each written natural language", arXiv:1307.6235v3[physics.gen-ph]. A preliminary study of words of dictionaries of twenty six languages, more accurate study of words of dictionary of Chinese usage and all parts of speech of dictionary of Lakher(Mara) language and of verbs, adverbs and adjectives of dictionaries of six languages are included.

[4] Anindya Kumar Biswas, "A discipline of knowledge and the graphical law", IJARPS Volume 1(4), p 21, 2014; viXra: 1908:0090[Linguistics].

[5] Anindya Kumar Biswas, ”Bengali language and Graphical law”, viXra: 1908:0090[Linguistics].

[6] Anindya Kumar Biswas, ”Basque language and the Graphical Law”, viXra: 1908:0414[Linguistics].

[7] Anindya Kumar Biswas, ”Romanian language, the Graphical Law and More”, viXra: 1909:0071[Linguistics].

[8] Anindya Kumar Biswas, ”Discipline of knowledge and the graphical law, part II”, viXra:1912.0243 [Condensed Matter],International Journal of Arts Humanities and Social Sciences Studies Volume 5 Issue 2 February 2020.

[9] Anindya Kumar Biswas, ”Onsager Core of Abor-Miri and Mising Languages”, viXra: 2003.0343[Condensed Matter].

[10] Anindya Kumar Biswas, ”Bengali language, Romanisation and Onsager Core”, viXra: 2003.0563[Linguistics].

[11] Anindya Kumar Biswas, ”Little Oxford English Dictionary and the Graphical Law”, viXra: 2008.0041[Linguistics].

[12] Anindya Kumar Biswas, ”Oxford Dictionary Of Social Work and Social Care and the Graphical law”, viXra: 2008.0077[Condensed Matter].

[13] Anindya Kumar Biswas, ”Visayan-English Dictionary and the Graphical law”, viXra: 2009.0014[Linguistics].

[14] Anindya Kumar Biswas, ”Garo to English School Dictionary and the Graphical law”, viXra: 2009.0056[Condensed Matter].

[15] Anindya Kumar Biswas, ”Mursi-English-Amharic Dictionary and the Graphical law”, viXra: 2009.0100[Linguistics].

[16] Anindya Kumar Biswas, ”Names of Minor Planets and the Graphical law”, viXra: 2009.0158[History and Philosophy of Physics].

[17] Anindya Kumar Biswas, ”A Dictionary of Tibetan and English and the Graphical law”, viXra: 2010.0237[Condensed Matter].

[18] Anindya Kumar Biswas, ”Khasi English Dictionary and the Graphical law”, viXra: 2011.0011[Linguistics].

[19] Anindya Kumar Biswas, ”Turkmen-English Dictionary and the Graphical law”, viXra: 2011.0069[Linguistics].

[20] Anindya Kumar Biswas, " Webster's Universal Spanish-English Dictionary, the Graphical law and A Dictionary of Geography of Oxford University Press", viXra: 2103.0175[Condensed Matter].

[21] Anindya Kumar Biswas, "A Dictionary of Modern Italian, the Graphical law and Dictionary of Law and Administration, 2000, National Law Development Foundation", viXra: 2107.0171[Condensed Matter].

[22] Anindya Kumar Biswas, "Langenscheidt's German-English English-German Dictionary and the Graphical law", viXra: 2107.0179[Linguistics].

[23] Anindya Kumar Biswas, "Essential Dutch dictionary by G. Quist and D. Strik, the Graphical law Classification", viXra: 2108.0040[Linguistics].

[24] Anindya Kumar Biswas, "Swahili, a lingua franca, Swahili-English Dictionary by C. W. Rechenbach and the Graphical law", viXra: 2108.0101[Linguistics].

[25] Anindya Kumar Biswas, "The French, Larousse Dictionnaire De Poche and the Graphical law", viXra: 2109.0080[Linguistics].

[26] Anindya Kumar Biswas, "An Arabic dictionary: "al-Mujam al-wáfi" or, "adhunik arabi-bangla abhidhan" and the Onsager's solution", viXra: 2109.0119[Condensed Matter].

[27] Anindya Kumar Biswas, "Langenscheidt Taschenwörterbuch Deutsch-Englisch / Englisch-Deutsch, Völlige Neubearbeitung and the Graphical law", viXra: 2109.0141[Linguistics].

[28] Anindya Kumar Biswas, Bawansuk Lyngkhoi, "The Graphical law behind the NTC's Hebrew and English Dictionary by Arie Comey and Naomi Tsur", viXra: 2109.0164[Linguistics].

[29] Anindya Kumar Biswas, "Oxford Dictionary Of Media and Communication and the Graphical law", viXra: 2109.0202[Social Science].

[30] Anindya Kumar Biswas, "Oxford Concise Dictionary Of Mathematics, Penguin Dictionary Of Mathematics and the Graphical law", viXra: 2112.0054[Social Science].

[31] Anindya Kumar Biswas, "An Arabic dictionary: "al-Mujam al-wáfi" or, "adhunik arabi-bangla abhidhan" and the Onsager's solution Second part", viXra: 2201.0021[Condensed Matter].

[32] Anindya Kumar Biswas, "The Penguin Dictionary Of Sociology and the Graphical law", viXra: 2201.0046[Social Science].

[33] Anindya Kumar Biswas, "The Concise Oxford Dictionary Of Politics and the Graphical law", viXra: 2201.0069[Social Science].

[34] Anindya Kumar Biswas, "A Dictionary Of Critical Theory by Ian Buchanan and the Graphical law", viXra: 2201.0136[Social Science].

[35] Anindya Kumar Biswas, "The Penguin Dictionary Of Economics and the Graphical law", viXra: 2201.0169[Economics and Finance].

[36] Anindya Kumar Biswas, "The Concise Gojri-English Dictionary by Dr. Rafeeq Anjum and the Graphical law", viXra: 2201.0205[Linguistics].

[37] Anindya Kumar Biswas, "A Dictionary of the Kachin Language by Rev.O.Hanson and the Graphical law" ("A Dictionary of the Kachin Language by Rev.o.Hanson and the Graphical law", viXra: 2202.0030[Linguistics]).

[38] Anindya Kumar Biswas, "A Dictionary Of World History by Edmund Wright and the Graphical law", viXra: 2202.0130[History and Philosophy of Physics].

[39] Anindya Kumar Biswas, "Ekagi-Dutch-English-Indonesian Dictionary by J. Steltenpool and the Onsager's solution", viXra: 2202.0157[Condensed Matter].

[40] Anindya Kumar Biswas, "A Dictionary of Plant Sciences by Michael Allaby and the Graphical law", viXra: 2203.0011[Mind Science].

[41] Anindya Kumar Biswas, "Along the side of the Onsager's solution, the Ekagi language", viXra: 2205.0065[Condensed Matter].

[42] Anindya Kumar Biswas, "Along the side of the Onsager's solution, the Ekagi language-Part Three", viXra: 2205.0137[Condensed Matter].

[43] Anindya Kumar Biswas, "Oxford Dictionary of Biology by Robert S. Hine and the Graphical law", viXra: 2207.0089[Phyiscs of Biology].

[44] Anindya Kumar Biswas, "A Dictionary of the Mikir Language by G. D. Walker and the Graphical law", viXra: 2207.0165[Linguistics].

[45] Anindya Kumar Biswas, "A Dictionary of Zoology by Michael Allaby and the Graphical law", viXra: 2208.0075[Phyiscs of Biology].

[46] Anindya Kumar Biswas, "Dictionary of all Scriptures and Myths by G. A. Gaskell and the Graphical law", viXra: 2208.0093[Religion and Spiritualism].

[47] Anindya Kumar Biswas, "Dictionary of Culinary Terms by Philippe Pilibossian and the Graphical law", viXra: 2211.0061[Social Sciences].

[48] Anindya Kumar Biswas, "A Greek and English Lexicon by H.G.Liddle et al simplified by Didier Fontaine and the Graphical law", viXra: 2211.0087[Linguistics].

[49] Anindya Kumar Biswas, ”Learner’s Mongol-English Dictionary and the Graphical law”, viXra: 2211.0101[Linguistics].

[50] Anindya Kumar Biswas, ”Complete Bulgarian-English Dictionary and the Graphical law”, viXra: 2212.0009[Linguistics].

[51] Anindya Kumar Biswas, ”A Dictionary of Sindhi Literature by Dr. Motilal Jotwani and the Graphical Law”, viXra: 2212.0015[Social Sciences].

[52] Anindya Kumar Biswas, ”Penguin Dictionary of Physics, the Fourth Edition, by John Cullerne, and the Graphical law”, viXra: 2212.0072[History and Philosophy of Physics].

[53] Anindya Kumar Biswas, ”Oxford Dictionary of Chemistry, the seventh edition and the Graphical Law”, viXra: 2212.0113[Chemistry].

[54] Anindya Kumar Biswas, ”A Burmese-English Dictionary, Part I-Part V, by J. A. Stewart and C. W. Dunn et al, head words and the Graphical Law”, viXra: 2212.0127[Linguistics].

[55] Anindya Kumar Biswas, ”The Graphical Law behind the head words of Dictionary Kannada and English written by W. Reeve, revised, corrected and enlarged by Daniel Sanderson”, viXra: 2212.0185[Linguistics].

[56] Anindya Kumar Biswas, ”Sanchayita and the Graphical Law”, viXra: 2301.0075[Social Science].

[57] Anindya Kumar Biswas, ”Samsad Bangla Abhidan and The Graphical Law”, viXra: 2302.0026[Linguistics].

[58] Anindya Kumar Biswas, ”Bangiya Sabdakosh and The Graphical Law”, viXra: 2302.0060[Linguistics].

[59] Anindya Kumar Biswas, ”Samsad Bengali-English Dictionary and The Graphical Law ”, viXra: 2304.0047[Linguistics].

[60] Anindya Kumar Biswas, ”Rudyard Kipling’s Verse and the Graphical Law”, viXra: 2304.0207[Social Science].

[61] Anindya Kumar Biswas, ”W. B. Yeats, The Poems and the Graphical Law”, viXra: 2305.0008[Social Science].

[62] Anindya Kumar Biswas, ”The Penguin Encyclopedia of Places by W. G. Moore and the Graphical Law”, viXra: 2305.0147[Archaeology].

[63] Anindya Kumar Biswas, ”The Poems of Tennyson and the Graphical Law”, viXra: 2305.0157[Social Science].

[64] Anindya Kumar Biswas, ”Khasi-Jaintia Jaids(Surnames) and the Graphical law”, viXra:2307.0135[Social Science].

[65] Anindya Kumar Biswas, ”Age, Amplitude of accommodation and the Graphical law”, viXra:2311.0110[Physics of Biology].

[66] Anindya Kumar Biswas, ”Dictionary of Ayurveda by Dr. Ravindra Sharma and the Graphical law”, viXra:2401.0030[General Science and Philosophy].

[67] Anindya Kumar Biswas, ”The Practical Sanskrit-English Dictionary by Vaman Shivram Apte and The Graphical Law”, viXra:2402.0041[Linguistics].

[68] Anindya Kumar Biswas, ”The Langenscheidt’s Pocket Russian Dictionary and The Graphical Law”, viXra:2402.0049[Linguistics]

[69] Anindya Kumar Biswas, ”The Scholar Dictionary Portuguese and The Graphical Law”, viXra:2402.0044[Linguistics]

[70] A. M. Gun, M. K. Gupta and B. Dasgupta, Fundamentals of Statistics Vol 1, Chapter 12, eighth edition, 2012, The World Press Private Limited, Kolkata.

[71] E. Ising, Z.Physik 31,253(1925).

[72] R. K. Pathria, Statistical Mechanics, p400-403, 1993 reprint, Pergamon Press,© 1972 R. K. Pathria.

[73] C. Kittel, Introduction to Solid State Physics, p. 438, Fifth edition, thirteenth Wiley Eastern Reprint, May 1994, Wiley Eastern Limited, New Delhi, India.

[74] W. L. Bragg and E. J. Williams, Proc. Roy. Soc. A, vol.145, p. 699(1934);

[75] P. M. Chaikin and T. C. Lubensky, Principles of Condensed Matter Physics, p. 148, first edition, Cambridge University Press India Pvt. Ltd, New Delhi.

[76] Kerson Huang, Statistical Mechanics, second edition, John Wiley and Sons(Asia) Pte Ltd.

[77] S. M. Bhattacharjee and A. Khare, ”Fifty Years of the Exact solution of the Two-dimensional Ising Model by Onsager”, arXiv:cond-mat/9511003v2.

[78] L. Onsager, Nuovo Cim. Supp.6(1949)261.

[79] C. N. Yang, Phys. Rev. 85, 809(1952).

[80] R. V. Chamberlin, M. Hardiman, L. A. Turkevich and R. Orbach, ”H-T phase diagram for spin-glasses: An experimental study of Ag:Mn”, PRB 25(11), 6720-6729, 1982.

[81] R. V. Chamberlin, George Mozurkewich and R. Orbach, ”Time Decay of the Remanent Magnetization in Spin-Glasses”, PRL 52(10), 867-870, 1984.

[82] http://en.wikipedia.org/wiki/Spin_glass

[83] S. F Edwards and P. W. Anderson, "Theory of spin glasses", J. Phys.F: Metal Phys. 5, 965-74, 1975.

[84] D. Sherrington and S. Kirkpatrick, "Solvable model of a Spin-Glass", PRL 35, 1792-6, 1975.

[85] D. Sherrington and S. Kirkpatrick, "Infinite-ranged models of spin-glasses", PRB 17(11), 4384-4403, 1978.

[86] J. R. L. de Almeida and D. J. Thouless, "Stability of the Sherrington-Kirkpatrick solution of a spin glass model", J. Phys. A: Math.Gen.,Vol. 11, No. 5,1978.

[87] A. J. Bray and M. A. Moore, "Replica-Symmetry Breaking in Spin-Glass Theories", PRL 41, 1068-1072, 1978.

[88] G Parisi, "A sequence of approximated solutions to the S-K model for spin glasses", J. Phys. A: Math.Gen.13 L115, 1980.

[89] G Parisi, "Infinite Number of Order Parameters for Spin-Glasses", PRL 43, 1754-1756, 1979.

[90] D. J. Thouless, J. R. L. de Almeida and J. M. Kosterlitz, "Stability and susceptibility in Pariss's solution of a spin glass model", J. Phys. C: Solid State Phys. 13, 3271-80, 1980.

[91] G. Parisi, G. Toulouse, "A simple hypothesis for the spin glass phase of the pnfinite-ranged SK model", Journal de Physique Lettres, Edp sciences, 41(15), pp.361-364, 1980; http://hal.archives-ouvertes.fr/jpa-00231798.

[92] G. Toulouse, "On the mean field theory of mixed spin glass-ferromagnetic phases", Journal de Physique Lettres, Edp sciences, 41(18), pp.447-449, 1980; http://hal.archives-ouvertes.fr/jpa-00231818.

[93] G. Toulouse, M. Gabay, "Mean field theory for Heisenberg spin glasses", Journal de Physique Lettres, Edp sciences, 42(5), pp.103-106, 1981; http://hal.archives-ouvertes.fr/jpa-00231882.

[94] Marc Gabay and Gérard Toulouse, "Coexistence of Spin-Glass and Ferromagnetic Orderings", PRL 47, 201-204, 1981.

[95] J. Vannimenus, G. Toulouse, G. Parisi, "Study of a simple hypothesis for the mean-field theory of spin glasses", Journal de Physique, 42(4), pp.565-571, 1981; http://hal.archives-ouvertes.fr/jpa-00209043.

[96] W L McMillan, "Scaling theory of Ising spin glasses", J. Phys. C: Solid State Phys., 17(1984) 3179-3187.

[97] Daniel S. Fisher and David A. Huse, ”Ordered Phase of Short-Range Ising Spin-Glasses”, PRL 56(15), 1601-1604, 1986.

[98] Daniel S. Fisher and David A. Huse, ”Equilibrium behavior of the spin-glass ordered phase”, PRB 38(1), 386-411, 1988.

[99] S. Guchhait and R. L. Orbach, ”Magnetic Field Dependence of Spin Glass Free Energy Barriers”, PRL 118, 157203 (2017).

[100] M. E. Baity-Jesi, A. Calore, A. Cruz, L. A. Fernandez, J. M. Gil-Narvion,.., D. Yllanes, ”Matching Microscopic and macroscopic responses in Glasses”, PRL 118, 157202(2017).

[101] P. W. Anderson, ”Spin-Glass I: A SCALING LAW RESCUED”, Physics Today, pp.9-11, January(1988).

[102] P. W. Anderson, ”Spin-Glass II: IS THERE A PHASE TRANSITION?”, Physics Today, pp.9, March(1988).

[103] P. W. Anderson, ”Spin-Glass III: THEORY RAISES ITS HEAD”, Physics Today, pp.9-11, June(1988).

[104] P. W. Anderson, ”Spin-Glass IV: GLIMMERINGS OF TROUBLE”, Physics Today, pp.9-11, September(1988).

[105] P. W. Anderson, ”Spin-Glass V: REAL POWER BROUGHT TO BEAR”, Physics Today, pp.9-11, July(1989).

[106] P. W. Anderson, ”Spin-Glass VI: SPIN GLASS AS CORNUCOPIA”, Physics Today, pp.9-11, September(1989).

[107] P. W. Anderson, ”Spin-Glass VII: SPIN GLASS AS PARADIGM”, Physics Today, pp.9-11, March(1990).

[108] J. K. Bhattacharjee, ”Statistical Physics: Equilibrium and Non-Equilibrium Aspects”, Ch. 26, Allied Publishers Limited, New Delhi, 1997.

[109] Sonntag, Borgnakke and Van Wylen, Fundamentals of Thermodynamics, p206-207, fifth edition, John Wiley and Sons Inc.