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of humanities*

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ETUDES ON A SCIENCE OF HUMANITIES

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...But knows nobody
And no one can tell,
What kind of my actions
Is leading to hell.

Please tell me, my Lord
If that task was from you
Or Devil is searching
My brain for his view?

ABSTRACT

A quantitative model concerning the methodology of measurement of perception based on the conceptions of N. Bohr and W. Heisenberg is discussed. It is shown that the usefulness of a question is determined by a relation of uncertainties allowing a definite exactness of response. This semiotic result seems to be a foundation of any methodology of quantitative estimations in the humanities. Some numerical results for the investigation of interrelations between poets' fame and their psychological features are presented as well as a mathematical description of the ranked fame of poets. A quantitative model of oscillating behavior of different psychological as well as economical manifestations of societies is suggested. The author would like to apologize for the extremely difficult problems considered.

I am so brave as to begin with my own verse, having in mind not its outstanding poetic quality but only its sense. Really the matter which I would like to consider seems to be something from the Devil's tasks. Of course, the concrete results which will be discussed are quite charitable, but conclusions and questions arising can appear to be not too pleasing to God... The matter to which some of us devoted our efforts can be described as an attempt to joint by a common language not only two branches of culture but two poles of any nonstatic being as well. Including the life of the human spirit, nations, and confessions. Is this possible? And if it is, is it not too dangerous to try to make a short circuit between two poles under so high voltage? Indeed, the exact cognition of motifs of action can destroy the action. The exact cognition of reasons for love exterminates love, it seems. But the realizing of reasons for illness can eliminate it (at least, some mental ailments as it was shown by Sigmund Freud). So realizing psychological motifs and in-soul movements is an extremely mighty instrument, and its application to living individuals or populations or to their Symbols of the Belief can occur not quite inoffensive and harmless and even not unpunished. But the "technical sweet" (words of Robert Oppenheimer, a famous scientist and Chief of the Manhattan project) appears to be too attractive. Let us try to understand - and let the sequences to be at their turn! This in my opinion is a psychological reason for the efforts of those who devoted their research to the roots of emotions, origin of perception, nature of the Belief, and other deep things which may better not be touched. But let us begin - with the open and kind spirit, with the Lord but not the Devil in our hearts.

WHAT IS THE SCIENCE OF HUMANITIES?

There are two strictly divided and well defined branches of human brain activity: the natural sciences and the humanities. This sharp division was established by Charles Snow in his outstanding analysis of the two cultures. But we can remember this division was absent at the time of the Renaissance, and the brain activity of the highest representatives of mankind combined all manifestations of human possibilities. As the centuries passed, specialization of different parts of brain activity led to the contemporary state where the representatives of different fields of culture cannot even understand one another.

Methods of analysis, kinds of syllogisms, and even style of thinking have became different. Of course it is not a fault of the evolution of culture, it is its natural course. But dialectics is all-mighty and a trend to a new integration of culture becomes now perhaps the most significant aim of the representatives of thinking. Is there any way for this purpose? Really we have to propose some type of translation of highly minded, extremely general, delicate and delicious but rather uncertain and qualitative thoughts of humanists to a severe language of exact natural sciences having predictive forces. Such a goal would be an attempt to elaborate some algorithms describing the dialog between left and right hemispheres of a human brain, as it was demonstrated brilliantly by Sergey Maslov and Vladimir Petrov.

I think this task is one of the Devil's questions to us. Really, sciences and humanities seem to be two parts of all-human "brain" (at a statistical sense, indeed) - "left" and "right", kind and angry, destroying or creative. Any reasonable poles are coexisting inside of each of us as well in mankind as a whole. It is dangerous to discuss such deep things! But let us have no fear: we have a great leader. Niels Bohr was the first to propose a model of interrelations between the exact sciences and psychology, asserting that the principle of complementarity from the quantum physics has an equivalent in psychology. It was extremely accurate choice of a genius: psychology is precisely a boundary field between science and spirit. I would like to define psychology as an apparatus for description of interrelations between the external world and internal world for each person or for population if we will discuss the psychology of communities too. Thus the Science of Humanities would be a system having as an aim the creation of acting models for. description of humanistic problems and prediction of phenomena of "spiritual" manifestations using the language of exact sciences. Of course such a wide definition includes a lot of interrelations between persons and their external surrounding. I will restrict myself to the discussion of two aspects: for a possibility of description of the "sancta sanctorum" of a person - precisely a psychology of creativity, and for some models of collective behavior of populations.

METHODOLOGY OF SCIENCE OF HUMANITIES, OR THE METROLOGY OF SPIRIT

Humanities and Statistics

The quantitative description of humanistic problems has a long history. I will mention only some names of contemporaries-Eysenck, Osgood, Birkhoff, Jakobson, Lotman, Kolmogorov, Nalimov, Maslov, Petrov, Gasparov, Mohl - in this list one can find linguists and mathematicians, literary critics and demographers... With different directions of activity, with different personal goals. But in all cases when humanistic problems are to be considered, statistics on some set of dates, persons, experts, and so on is applied. Maybe it is the single common feature of all quantitative attempts and efforts in humanities. And it is of course not an accidental coincidence. The methods of investigation have to be adequate to the subject explored. All the matter concerning humanistic problems is determined by the immanent essence of the subject researched, precisely by the psychology of personalities under investigation independently of the concrete manifestations. Any psychological manifestations are probabalistic. Any characteristic of a person or society is a statistical mean value of different actions or words or mass movements. So no one action is strictly determined, but has a probability. The mathematical apparatus for description of probabilistic manifestations is mathematical statistics. This truistic passage for the apologies of an application of statistics to humanistic researches was written with only purpose to use it for the following considerations.

The Unity of Opposites or Polar Scales in Everyone

But I have to comment on one more thing, which is also very well known to psychologists and even better to philosophers. I have in a mind the polar scales in psychological measurements proposed in Jung's and Eysenck's works and then developed by Osgood in the method of the semantic differential. The heuristic method of polar scales is consistent with quantitative estimations of qualities, mainly those ones which can not be determined by any definite algorithm. (I would like to note that Salvador Dali had applied a similar method to evaluate the qualities of painters. He did not know about the method of polar scales but he constructed something similar. Only one - but important - disappointing detail: there were a lot of great names and only one expert, precisely Salvador Dali. It is not enough even in the case of so high qualified an expert, because in this case personal biases can not be excluded). The essence of the method consists of the following empirical procedures. The researcher "invents" some opposite qualities or conceptions of interest to him, and asks a number of independent experts to estimate on some normalized (or non-normalized) scale their perception of this or that feature of a subject, person, event, picture, slogan (and so on) using a marking system. Oppositions suggested can be arbitrary (such as "warm-cold", "pessimistic-optimistic", "kind - angry", "patriotic-cosmopolitic"...), but they must have precisely the opposite sense. After obtaining such numerical estimations, the experimenter performs a statistical treatment and receives an average numerical value, evaluates the statistical errors, the distributions

of meanings, etc. It was shown by Osgood that at any choice of different polar scales only three (or maybe four or five in the opinion of some Osgood's followers) characteristics are really independent - orthogonal, using mathematical terminology.

Precisely Osgood introduced "the metrics of a space of psychological features" - the semantical differential being a "denotative distance" between "connotative meanings". The introduction of numerical descriptions into the psychological (and then other humanistic disciplines) determinations was in my opinion the starting point for a "great unification" of humanities and exact sciences. The method of polar scales is the "materialization" of Hegel's dialectic conception of the "unity and struggle of opposites", present in any non-static object - from the developing Universe to the psychology of a person. What is "non-static" - in this application? The sense of Hegel's general law relates precisely to such systems which have two competing oppositions, connected by so called "negative reverse bonds" assuming the appearance of some "force" - in a generalized sense, of course, - directed to the side opposite to the direction of a deviation of a system from the equilibrium or static state. No one state of being is a static one. But characteristic times of non-static manifestation are different - from billions of years for the Universe and thousands for animals populations to tens of years for economics, to minutes for periodic Belousov-Zhabotinsky reactions, to picoseconds for oscillations of nuclei of atoms. A huge number of pairs of competing essences are co-existing in any system.

Each person consists of co-existing opposite features and manifests them in a real actions. The statistics of a large number of actions can provide the significant determination of the prevailing, dominant characteristics of everyone. The polar properties, the poles, The Devil and The God are coexisting in our souls, and only The Statistics of events can decide Who is the - Statistical - winner in this inter-soul struggle. Paraphrasing the title of the famous Ilya Prigogine book: "The becoming is inside the being". At any time. In any dynamic system. Moreover: the conflict of being is the origin of becoming.

The art of questions and the principles of obtaining responses

N. Bohr's conception of psychology was proclaimed sixty years ago (see N. Bohr, 1961) but as far as I know without any continuation in a constructive sense till now. N. Bohr had pointed out in a qualitative manner that there is a principle of complementarity in the psychology of perception similar to some extent to the principle of complementarity in quantum physics.

One of its gnosiological interpretations. When some instrument is measuring any parameter of a particle the particle is interacting with this device. This interaction changes the parameters of a particle (as well as the measuring device) and thus a result of measurement contains the information not only about parameters of a particle but about parameters of a measuring instrument as well. Precisely this kind of interrelation seems to be present in the consideration of "subject-perception". Of course neither N. Bohr nor his follower are not claiming the quantum mechanical origin of psychological laws. But the observations of similarity pointed out by

N.Bohr are exciting.

The mathematical expression of Bohr's principle of complementarity is the relation of uncertainties of W.Heisenberg, being the result of a quantum mechanical speculation of the act of measuring. I will comment on this expression for humanists, because it is very well known to scientists.

Any measurement is performed with some definite error, being determined by the possibilities of the device. If one attempts to measure two parameters (X and Y) of a system in one experiment, the uncertainties, errors of their determination (ΔX and ΔY) are linked by a quite strict inequality

$$\Delta X \cdot \Delta Y \geq h \tag{1}$$

where h is Planck's constant.

One of the most important conclusions is that the exactness of determination of a parameter X become worse in inverse proportion to the exactness of a determination of a parameter Y. This general expression reflects the interrelations between so called conjugate parameters of a particle having in quantum mechanical description at the same time the properties of waves. I'm not sure the psychology of perception has any direct quantum mechanical origin. But in spite of this, one can obtain some kind of uncertainty expression for interrelations of question and response in the semiotical sense. Of course it will not be based on the wave properties of these essences, but it seems some similarity, maybe, is determined by a statistical nature of some quantum parameters in the M. Born sense. As to the psychology of persons as well as of communities one can be sure that it has precisely a probability origin. Moreover I would like to point out one extremely significant parallel between the quantum mechanical understanding of measurement of particle parameters and the action of behavior of a person. As it was mentioned above, the wave function describing any quantum system is a distribution of probabilities for a particle to have a definite parameter from those permitted. After measuring, just one of all the packet of possibilities is occuring. This reduction of a wave packet of probabilities cannot be determined in any terms besides the matter of chance, because we cannot describe the result of interaction between a particle and a measuring device with an exactness more than (1). We can establish something similar concerning the real action of a real person in real circumstances.

You cannot predict exactly any single action of your friends (and even an action of your own!), but you may expect that the action will be chosen from a packet of actions being possible for a definite person. The "list" of these possibilities and their probabilities has been estimated by you based upon all your previous experience. By calculations or intuitively - in this sense it is the same. So in a psychology of behavior we can see the reduction of a packet of probabilities as well.

Let us consider a simplest model of recognition of some essence, expressed using the polar scale of meanings with infinite limits. Let us assume the signal is translated by a system T, and that a signal has to be determined by the T-system as a meaning of some object on the named scale. The task of recognizing this signal by an

accepting system A consists in the identification of an object using its meaning translated by T-system. Let X be the current meaning of an object on a definite polar scale. Let M_T and M_A to be the most probable meanings of the same object in the independent and direct estimations by the systems T and A subsequently. Let the Gaussian like functions describe the intensity of the signal translated and the sensitivity of the accepting system. σ_T and σ_A subsequently are the dispersions of functions (2) and (3). T_0 and A_0 are the constants describing the power of translation and the power of perception:

$$T(x) = T_0 \exp\left[-\frac{(x - M_T)^2}{\sigma_T^2} \right] \tag{2}$$

$$A(x) = A_0 \exp\left[-\frac{(x - M_A)^2}{\sigma_A^2} \right] \tag{3}$$

What are the dimensionalities of T and A? It is a matter of the type of interrelations between T and A systems. Of course any kind of transfer of any information is determined in the last account precisely by energy transfer. In the case of a link "radiation source - photoelectric detector", for instance, the dimension of T is the energy, the dimension of A is the relation of energy of a response, or number of electrical current carriers or voltage occurring, to the energy accepted. At this case X and M_T, M_A, σ_T and σ_A are of the wave-length dimension. But one can use not so "deep" parameters and express T in terms of the quantity of information ill the Shannon-Brillouin sense (in bits or in calories per Kelvin). For purposes of description of perception the last one may be the most natural. At this ease X, M and σ dimensions are to be the dimensions of the meanings, which can be dimensionless on the one-dimensional scale discussed. I would like to underline that functions (2) and (3) are not normalized to unity; they are not a probability distributions, but just dimensional functions of energy or meanings or something else.

The whole intensity of the response of the A-system is the overlapping integral throughout the infinite interval of meanings

$$R = \int_{-\infty}^{\infty} T(x) A(x) dx = \frac{\sigma_T \sigma_A \sqrt{\pi}}{\sqrt{\sigma_T^2 + \sigma_A^2}} \exp\left[-\frac{(M_T - M_A)^2}{\sigma_T^2 - \sigma_A^2} \right] \tag{4}$$

The main idea of the following speculation is based upon the assertion that the signal of T can be detected by a system A in a condition when the level of R appears to be greater than the level of noises N,

$$R \geq N \tag{5}$$

As to the dimensions of noises, we have to use the comments applied earlier. Of course such an approach is similar to the usual considerations in optics or radio-

engineering, but we will try to extract some new sense. I would like to note that we will omit now any discussion of possibilities of a detecting signals with the power lower than the power of noises. Using (4) in (5) one obtains:

$$\sigma_T \sigma_A \geq \frac{N}{\sqrt{\pi}} \sqrt{\sigma_T^2 + \sigma_A^2} \exp\left[-\frac{(M_T - M_A)^2}{\sigma_T^2 - \sigma_A^2}\right] \qquad (6)$$

I have written this expression in the form most comparable to Equation (1), because we know precisely the statistical characteristics of uncertainties of meanings of T- and A-functions.

One can see some similarity between (1) and (6). But as was obvious from the beginning, the analogy can not be complete: the right side of (1) is Planck's constant, and in (6) the right side is dependent on the parameters of T- and A- systems as well as on the noise level. Thus (6) does not have such "universal" significance as the Heisenberg unequality (1), but one can conclude after an analysis that a right part of (6) is quite less sensitive to the values and thus one can consider it as a constant at some combinations of T- and A- systems with approximately constant noise levels and not too big differences between a priori average meanings of same objects in T- and A- systems in direct and independent estimations. Some simplifications just for recognizing. Let us assume for the width of distributions at T and A, that the dispersions are equal ($\sigma_T = \sigma_A = \sigma$). In this case (6) transforms to:

$$\sigma \geq N\sqrt{\frac{2}{\pi}} \exp\left[-\frac{(M_T - M_A)^2}{2\sigma^2}\right] \qquad (7)$$

If $(M_T - M_A)^2/\sigma^2 \ll 1$ means that a difference between the meanings of the same object at both systems is less than the width of distribution - the measure of uncertainty), one obtains after expansion :

$$\sigma \geq \sqrt{\frac{2}{\pi}}N\left[1 + \frac{(M_T - M_A)^2}{2\sigma^2}\right] \qquad (8)$$

At zero approximation, $(M_T - M_A) = 0$, one can see that even with such outstanding coincidence of T- and A- systems in their independent polar scale evaluation of the same objects an uncertainty of signal (and uncertainty of a response) must be quite certain, not less than the noise level. Even if the noise level is zero, the width of the distributions have to be finite, or recognition of a signal cannot occur. In a first approximation one obtains some more complicated expressions forthe uncertainty necessary for recognition. Of course the necessary uncertainty is arising with the growth of difference of a priori mean meanings at two systems, as it is obvious from the following expression for the case $(M_T - M_A)^2/\sigma^2 \gg 1$

$$\sigma \geq \frac{N}{2\sqrt{2\pi}}\left(M_T - M_A\right)^{3/2} \qquad (9)$$

Of course the analysis can be carried further, but let us stop at this point: it is enough for the purpose to show that if one wants to obtain any adequate answer to his question, one must formulate his question not too exactly, but with some uncertainty. Only by this condition one obtains a possibility to receive a response with a probable error within an interval described by Equation (6). If you make your question more exact, you will lose in the exactness of a answer. So the art of question statement is a skill of making them uncertain to a definite extent of course, to such an extent determined by Equation (6). I'm not sure this conclusion is too charitable. It was at least surprising for me personally why psychological tests using Jung - Eysenck - Osgood techniques give such statistically stable results even in cases when the scale questions offered were so abstracted from the common image about the object considered (for example the scale "warm-cold" in an application to auto design!).

Taking into account Equation (6), being the concretisation of Niels Bohr's idea, my fear is somewhat calmed. It seems to me I understood that the root of psychological investigations' success is just the uncertainty of the questions asked. Indeed the experimenters do not require any explanation of reasons of this or that estimations of experts. The experimenter does not order any exact algorithm of evaluation. So the last remains uncertain to some extent, and precisely this provides the possibility to use just intuitive marks on polar scales suggested - not from calculations but from emotions. I'm not sure the creators of contemporary psychology had realized that their brilliant methods, providing numerous certain results, are based really just on the uncertainty of their questions precisely in the style analyzed by N. Bohr sixty years ago. This does not decrease their glory of course! But what is the strange thing: obtaining exact dates in psychology is a result of "unexactness" of an algorithm of estimations! Is it a Devil's joke? Just this joke is a foundation of a methodology of contemporary psychology. This joke is the foundation of our psyche as well. Niels Bohr was right. As always.

POETS: PSYCHOLOGY AND FAME

This section is a demonstration of the application of statistical methods to the quantitative investigation of the psychology of writers, poets especially, at the base of statistics of expert estimations of their creative heritage using a method of polar scales. I will not do any detailed description of the method used.

One can find it in the references attached (Koshkin et al, 1995, 1991). Some results only are given.

1. The fame of poets is accurately described by the logarithmic rank distribution of the Lotka-Zipf type. In ranked fame of Russian poets during the period of 1789 - 1917 (by estimations of the contemporary readers) the maximum point was achieved by Alexander Pushkin. But "the struggle" for the next stairs of poetic glory appears to be quite hot. The statistics put all the "pretenders" at their places at the "table of fame

ranks" in history (see Figure 1). Glory is God's will, but a recognition of your own place at the table named above can appear to be the Devils task.

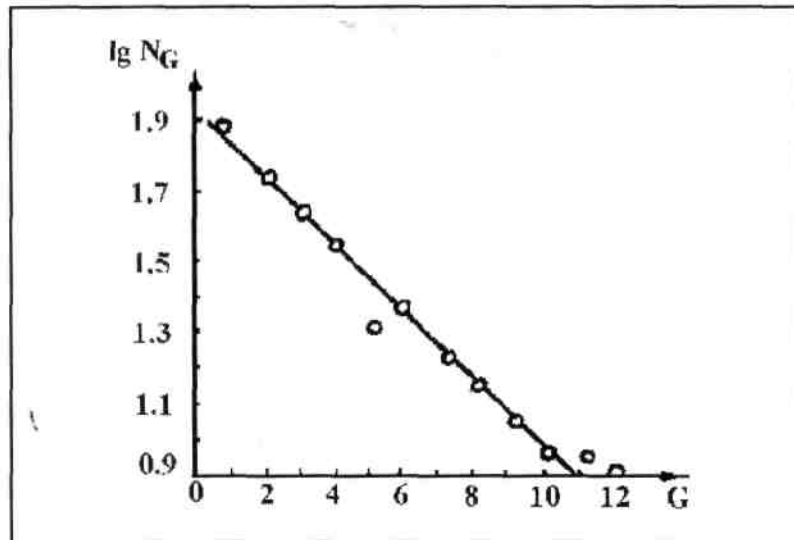Glory to God, He leaves the final decision to the time after one's final...

Figure 1. The dependence of logarithm of a number of poets holding a definite rank of glory on the rank of glory assessed by experts

2. Ii became possible to show quantitatively (hat the psychological features of personality have a determining role in poetic success. It was shown that the growth of poetic fame is correlated with the degree of introversion of poets' personalities. Note: it is statistical law, deviations for any given person can occur, but the general rule for a totality of poets is just this.

These results were obtained from the consideration of more than 300 Russian poets, using bipolar scales to obtain numerical estimations from 13 experts (see Figure 2).
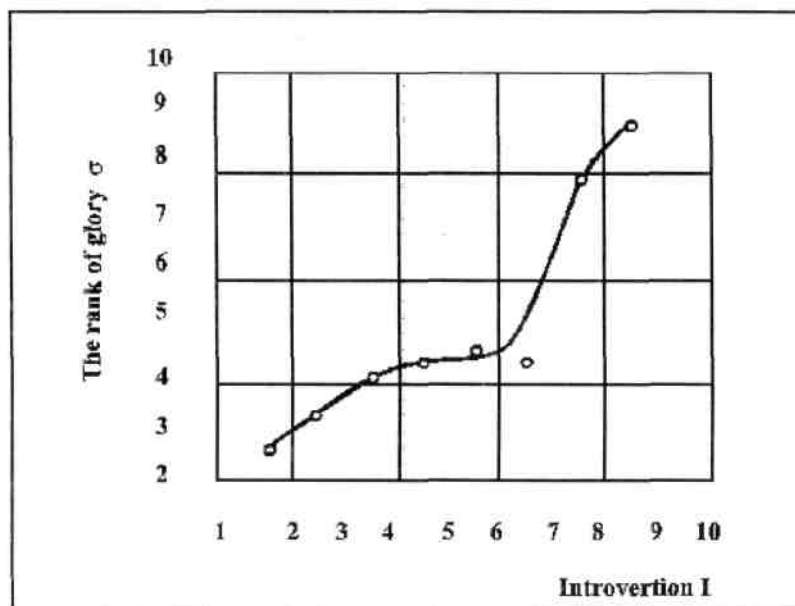

Figure 2. The dependence of poetic glory G on the introvertion I of a poet personality

3. The method of polar scales was applied to the exploration of the psychological features of two great poets: A. Pushkin and T. Shevchenko using only expert estimations of their poetic heritage - 678 and 245 verses respectively – with independent estimations of each verse on 10 polar scales suggested to experts. I will not describe the statistical details as well as the list of questions and conclusions obtained: one may see them in the articles cited above. Only an overview of the results will be given. As a whole, the statistical portraits show good concordance with remarks on the two poets made by their critics and biographers. But I would like to underline that now we obtain quantitative data, which can be checked, compared, and used in objective, precise numerical expressions. This is it seems something new to a completely qualitative literary knowledge: statistical psychological literature metrics, as we have called this approach. We have used not only the statistics of meanings but frequency analysis as well.

This gives us the possibility not only to establish the predominant features of the poets investigated but to evaluate the measure of "application" in the poet's real life of this or that feature of personality. This part of the analysis led to some "unexpected" conclusions. One example only. It appeared that A. Pushkin, being undoubtedly a patriot and nonconformist (it is clear from the statistical analysis of meanings), had expressed these personal preferences quite rarely - they were not the dominant motifs of his creativity or his personality. On the contrary, T. Shevchenko, having the same dominants of psyche, expressed them often. The relations with motherland, the relations with state power were extremely important for Shevchenko's personality, but were indifferent for Pushkin. One may conclude that relations with compatriots are not determinants of poetic fame.

4. I had the possibility and pleasure of delivering some of the results described above to numerous meetings of classical literary critics. It was extremely interesting for me, taking into account the hardly comparable approaches of the scientific and humanistic branches of culture. I will not comment on the sharp (very sharp!) discussions which were determined precisely by mutual misunderstanding of the representatives of these two parts of "mankind's brain" mentioned at the beginning of this chapter.

But one question is invariant even for different kinds of perception. That is the question of whether a poet's creativity reflects his psychology or is an attempt to show himself in the light which would be advantageous in readers' eyes. To receive the definite answer to this question, Lena Kuzmina and author performed a special investigation of the subject. We used 22 polar scales for numerical expert estimation of the psychological features of two excellent contemporary poets - Oksana Zabuzhko and Yefim Bershin. We drew the "statistical portraits" of both using the method applied earlier to their canonized forerunners. At the same time we asked both poets to estimate their own psychological peculiarities on the same scales. Without the details: the coincidence of "statistical" and self-portraits appears impressively complete. (We even checked the frankness of the persons under investigation using the standard Eysenck tests). The extent of coincidence was so close that it was surprising even for the authors of the research. No any doubts: the poet's self-expression in creativity reflects a cognition of himself.

Pasternak was right: "Creation's goal is self-sacrifice, but not sensation, not success..." (I hope the reader will forgive my not too perfect translation!). What is the conclusion of this section beyond the concrete results discussed? One only which I wish to emphasize: contemporary methods of psychology can be applied to the quantitative investigation of the personalities of creators: the statistics of intuitive, not too certain numerical evaluations of experts provides a possibility to formulate quantitative regularities, some laws of creativity and rules for glory as well as to obtain objective portraits of poets, even those who died long ago.

But that is not all. The creative results of mankind remain for centuries after they were produced. This provides the possibility of analyzing in a quantitative manner not only the psychology of creators but the psychology of societies, the representatives of which creators were.

The next section deals with this problem.

DYNAMICS OF BEHAVIOR, AND AN ATTEMPT TO DESCRIBE STATISTICAL COMPETITIONS

Waves of community behavior

Let me recall two results which you know very well of course. I have in a mind the famous Kondratyev "long waves in economics", being applied now for economical prognosis in all the countries (see Men'shikov & Klimenko,1989), and the not so widespread result of Maslov, who showed the presence of waves of architecture styles during some centuries. In my opinion Maslov's discovery is not less significant than Kondratyev's one.

The more so, as Maslov demonstrated also that the period of economic waves and the period of waves of spirit manifestations (architecture!) are coinciding. This period is close to 50 years. It seems that this periodicity is not connected at least directly with the 11-years Chizhevski sun cycles. Maslov's interpretation of its origin is based at an assumption of change of paradigms of communities, caused by a "struggle" between "left" and "right" hemispheres of human brains for the governing the behavior (Maslov, 1983). Petrov's researches established this firmly; it became not an assertion but a fact of contemporary knowledge (Petrov, 1988). Petrov's numerical analysis showed that the contradiction between "left" and "right" in the human brain is the motive force of development of the oscillations. Petrov's empirical aesthetics dealt mostly with music and painting. We had done the investigation of poets' psychology using the polar scale "introversion-extroversion" and confirmed a presence of 50-years periodicity, coinciding with "architectural", musical, and economic waves (see Figure 3). It is really the law of a societies life for all countries and ethnoses. But what is the reason for this intrinsic struggle? What are the mechanisms of this strange oscillation in a population's behavior?
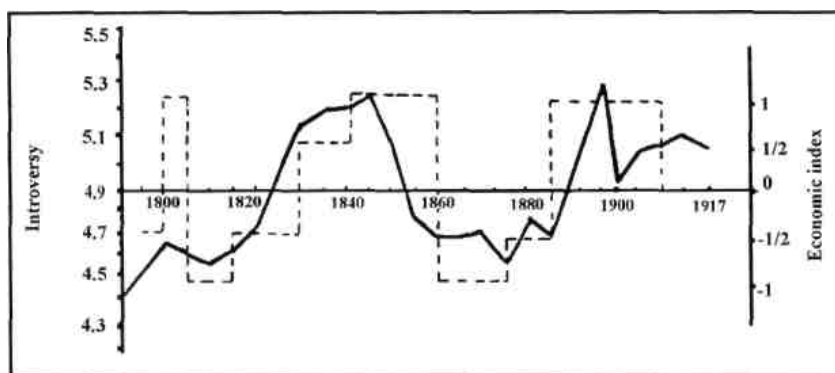
Figure 3. The dependence of the mean introversion of Russian population and its economic index

Of course one can say the description must be of a Volterra type for the interrelations between "predator-prey", having the oscillating solutions at definite conditions. But I can not reveal any antagonistic interrelations inside each of us which can be described at terms of eating one part of our brain (or body) by another part.

Of course one can claim all this is connected with nonlinear dynamics of statistical systems at the style of synergetics, precisely in the direction developed brilliantly by I. Prigogine (see, for instance, Prigogine, 1980). Of course it would be very similar. But I can not invent any possibility to introduce the reality into this outstanding theory if we want to obtain some description and predictions at a field of individual psyche or societies movements as well.

Of course one can recall the results of J. Forrester's global dynamics, using huge sets of Boltzmann-type kinetic equations with empirical coefficients describing industrial, financial, ecological, and other parameters. The numerical solutions can also give some nonmonotonic behavior but I have never seen any possibility for strict periodicity.

It is not a criticism of not so highly educated person having some decisive idea for explanation of all events in the World. My admiration of the names and results listed above is frank and complete. But preserving my inborn modesty I would like to suggest a different description, which in my opinion can provide some new possibilities.

Not Boltzmann but Newton-like kinetic equations

The general description of time evolution of any system is based on the Boltzmann kinetic equation:

$$\frac{dn_i}{dt} = I\left(n_i, n_j, t\right)_{(j \neq i)} \tag{10}$$

where at a simplest case n_i, n_j are changing numbers of particles (or individuals), and $I(n_i, n_j, t)$ is so called integral of collisions, which can be dependent on the numbers n_i, n_j of different particles in a system and directly on the time t as well, n_j

designates all other particles not coinciding with n_j. The left part of Equation (10) presents the rate of changing the number of particles. As to $I(n_i, n_j, t)$, it expresses contributions to the rate of change by any probable mechanism. Any concrete problem, of course, requires some concrete model and the ideas of the researcher have to be introduced precisely into the right part of Equation (10). For instance, for a description of a growth of single-sexual population (as well as for atomic nuclei decay) one is assuming I to be proportional to the number of individuals (or nuclei). For bi-sexual population (as well as for processes of binary reactions in physical or chemical problems) the rate of change per unit of time is supposed to be proportional to n^2, because two persons (or two particles) have to meet for reproduction (or for annihilation), etc. The Boltzmann equation is extremely fruitful, and the author do not intend to destroy anything in science! But I would like to offer a different possibility for the description of evolution of some systems. Really, change of a rate means a presence of acceleration. Let us try to build an equation just for it, putting in the right part terms describing precisely the values which are determining an acceleration. It would be something like the Newton equation for dynamics of mass:

$$\frac{d^2 n_i}{dt^2} = A\left(n_i, n_j, t\right). \tag{11}$$

Let us name the function at the right side as "integral of acceleration". Intending to investigate a concrete problem, one has to suggest some model and use his skill to solve a differential equation, as in the case of using the Boltzmann equation.

Let us try now to consider such a problem. There are two parts of a system with whole number of particles N, and X and Y being the numbers of particles in each part respectively ($X+Y=N$). The particles have a property to "choose" for their life precisely that part of system, the occupation of which is less than of the other. Our particles (or persons) have also a possibility (or right) to change freely their citizenship. Let us assert the acceleration of X and Y changing is proportional to the difference of occupations of two parts of the system :

$$\frac{d^2 X}{dt^2} = K_X^2\left(Y - X\right); \tag{12}$$

$$\frac{d^2 Y}{dt^2} = K_Y^2\left(X - Y\right), \tag{13}$$

K_X and K_Y are the coefficients describing an "inertness" of subsystems. Taking into account $X+Y=N$ one obtains :

$$\frac{d^2 X}{dt^2} + 2K_X^2 X = K_X^2 N; \tag{14}$$

$$\frac{d^2Y}{dt^2} + 2K_Y^2 Y = K_Y^2 N; \qquad (15)$$

Using the natural starting conditions (which are not too important at this case): *X(0) = 0, Y(0) = N*, both derivatives are zero, the expressions for number of occupied positions at two subsystems are as following :

$$X = \frac{N}{2}\left(1 - cos\sqrt{2K}\cdot t\right); \qquad (16)$$

$$Y = \frac{N}{2}\left(1 + cos\sqrt{2K}\cdot t\right). \qquad (17)$$

It is obvious precisely the oscillating behavior of both occupations. Simple analysis shows that in a case of two subsystems in this simplest model $K_X = K_Y$, thus frequencies of oscillations of both values are equal. Of course it was clear from the beginning -just for two subsystems, connected only by the possibility of exchange of particles. But I'm not sure it would be the same in more complicated conditions. It is not clear for me now if Einstein-like or Onsager-like symmetry of kinetic coefficients will be suitable for the description proposed.

I have to note that equations of a type like (11) can be generalized in some directions. First of all, an arbitrary number of subsystems can be considered. Any possible interactions of "particles" influencing a process rate acceleration can be taken into account by appropriate terms at the right side of (11). For instance, the account of a number of subsystems leads to a set of equations as following :

$$\frac{d^2X_i}{dt^2} = \sum_{j \neq i} K_{ij}\left(X_j - Y_i\right). \qquad (18)$$

It is suitable for a description of systems even without any other interactions besides of an extremely strange one -just a "desire" of "particles" considered to be members of a not so dense community. It seems one can use these equations for a description of any migration processes, introducing some "weights" of each member of definite population, for example, its prosperity, etc.

Would it be useful for prognosis of human migrations? Would it be useful for prognosis of financial investments dynamics or for a prevision of results of fight for markets? - Devil's questions. I think Kondratyev's economic waves and G. Soros (1991) alternations of industrial booms and recessions in trade have an origin considered above. It is not enough for microscopic consideration of systems because for this aim we have to introduce in (11) some terms describing the reasons for such "desire", some repulsive potential between particles at the same subsystem or attraction of members of different communities. But it seems it is enough for macroscopical, phenomenological description at least. Really an experience of generations, checked numerically by scientists named above shows the presence of a

"repelling" of new generations and previous ones. Maybe the reason is the desire of new competitors not to compete in the ring belonging to former winners. It is the choice of the weakest in the population, that is the choice of those, who feel no possibilities to compete using rules and paradigms, elaborated by nearest forefathers. I must underline that the word "weakest" is conventional. It means weakest at the established rules for stable circumstances. I had considered far ago (Koshkin, Zabrodskii, 1983) a role of weakest in populations, which become decisive in conditions of rapid change of rules of survival. This choice can be done at a subbrain level of an individual, but, returning to the beginning of this chapter, this precisely predetermines the statistics of actions of everyone. A change of community paradigms is a result. It seems it is the reason of Maslov's claim, it seems it is the reason of oscillating behavior of mental preferences of populations. It is a reason for a choice of a "brain governing" - left or right. It seems this precisely is the reason of national and religious gatherings (Koshkin, 1996). This choice is determined by an unusual reverse bond, the origin of which is only a difference of occupations of ethologic (as well as ecologic) niches by a population. This simple mechanism seems to be suitable for explanation of any kind of periodicity of populations manifestations.

Let us return again to Maslov's and Petrov's works. They have shown that the economic Kondratyev waves have the same period as "architectural" and "musical" ones and appear somewhat behind the latter. We have shown that "psychological" waves are at least not late compared to economics. Maslov's outstanding results have, to me, a deep philosophical significance. The statement is that spiritual movements are determining for economics. I do not know what answer would be better for God as well as for the Devil, but I would like to note that equations of (11) and (18) types can provide the possibility to describe these interrelations – without analysis of their roots, to my regret. This would be better a subject of a separate communication, but I will say that the introduction of some external influences into Equations (11) and (18) is possible. Some hopes appear for understanding the phase shift mentioned. In this connection only one application of (11). Petrov's results show there is a trend in oscillating evolution of some characteristics of creativity across the centuries, if one suppose dependence of population number (il is a whole capacity N in Equation (12)) to be a linear function of time within a term under investigation (it seems to be verisimilar) the trend mentioned can be easily obtained.

I had mentioned earlier that polar scales of opposite qualities are presenting at each of us (as Dr. Jeckell and Mr. Hyde described with scientific exactness by the novelist Stevenson). I believe our soul or our mood movements - from gay to sorrow, from anger to love, from left to right, are governing also by the differences of occupations of possible states in our minds as well as at our communities. With an account of any external influences which can and have to be introduced to Equation (18) as well as to the schedule of our real life.

I would like to apologize to the reader for maybe too many pretentious claims delivered. But it is still not a science, it is rather its threshold. In my performance at least. That is the reason why I permitted to myself so great a share of emotions (estimated on the polar scale "brain-feelings"), the more so the issue to which this

article is directed to is just "Emotions and Art".

And:

...knows nobody
And no one can tell,
What kind of my errors
Is leading to hell!

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