

EIR Feature

Why 99.9% of economic experts are wrong

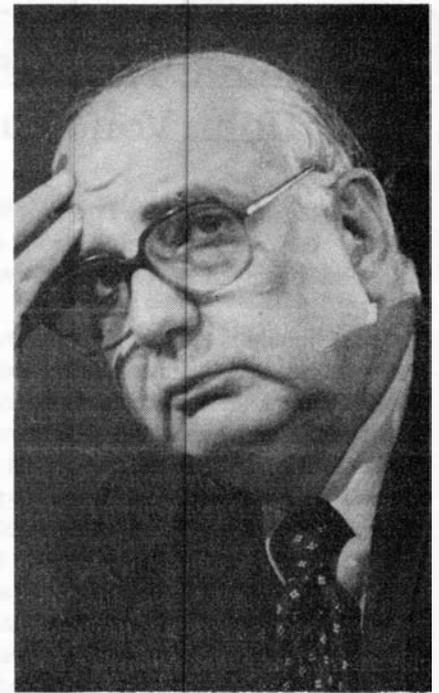
by Jonathan Tennenbaum

Dr. Tennenbaum gave this speech to a conference of the Schiller Institute and the Civil Rights Movement-Solidarity in Kiedrich, Germany, on Dec. 10-12, 1993. He is the director of the Fusion Energy Forum in Germany.

If it were possible to speak of positive benefits from the present worldwide crisis, then certainly one such benefit would be the undeniable *empirical proof*, that the prevailing economic ideas and theories—the economics taught in our universities and business schools, which have been the basis for the policies of leading nations over the last two decades—are nothing but a pile of garbage. The events since 1989 have proven that 99.9% of the world's reputed experts on economics and financial affairs are dangerous charlatans, no better than the astrologers, soothsayers, and magicians who have infested the temples and palaces of civilization since the times of Babylon.

Haven't we all been hearing them, for 20 years now, tell us about the economic upswing just around the corner, about the virtues of radical free trade, deregulation, and the post-industrial society? And now, as everyone becomes aware that we are in a depression, we have the most incredible, psychotic line coming out of the financial establishment and being repeated by leading politicians of the United States, Germany, and other countries. They now warn, that there could be a catastrophic collapse of the world financial system, if the radical liberalization of trade is not immediately pushed through. This is psychotic: If they now admit that *their own insane policies* have driven the financial markets to the edge of utter collapse, then what authority do they have to prescribe the remedy?!

The well-known French economist Maurice Allais is of course absolutely right, in publicly denouncing the World Bank and OECD and related institutions, for gross incompetence in economic affairs. Allais points out that the so-called RUNS model—a vast World Bank computer economic model with 77,000 parameters—is nothing but a bluff, a swindle with no scientific basis, whose only



Among the “experts” who can’t seem to get it right are, left to right: John Von Neumann, known as the father of the modern digital computer; Harvard economist Jeffrey Sachs, author of the “shock therapy” program which has devastated Russia; and former Federal Reserve Chairman Paul Volcker, whose high interest rates started the current depression mudslide.

purpose is to provide a justification for policies which were decided upon in advance. He notes, for example, that the World Bank model makes no distinction in statistics between human beings and farm animals, revealing the anti-human ideology of that institution. Allais doesn’t go far enough; he doesn’t attack the errors of thinking which lead to tolerance of such frauds. He only hints at the fact, that the methods of the World Bank, International Monetary Fund, “free trade,” and “shock therapy” are intrinsically fascist and genocidal in nature. In fact, Lyndon and Helga LaRouche have been the only international public figures to have publicly declared, for two decades, that the policies of the IMF and the World Bank, of the Club of Rome, are identical in underlying principles to the policies which led to the Nazi extermination camps of World War II. If more and more of our world, under the domination of the IMF-World Bank-United Nations apparatus, looks like a concentration camp, that is no accident.

Such things as the RUNS model are of course frauds, but they also reflect the fact, that the oligarchical ideology predominating in those institutions is unable to understand the basic principles of economy. That is the underlying reason, why the vast majority of so-called economist experts—most of whom are working directly or indirectly for oligarchical interests—have been wildly wrong in their evaluations and predictions of economic events of the past 25 years.

No one, in this situation, has more credibility than Lyndon LaRouche and our organization. Every single day and practically every hour for more than two decades, all over

the world, we have talked about the ongoing world economic collapse. We have warned of the crisis, we have explained its causes, we have proposed the remedies, we have identified the institutions and persons responsible for the disaster, and so on. We have not been able to stop the collapse up to now. But our work has not been in vain. The world would have been in much worse condition, had we not done what we have done. And, more important, we have built an institutional authority which is unique on the surface of this planet.

In this situation, our task is, above all, to turn the attention of people to the basic errors in thinking which permitted them to tolerate insane economic policies for so long, and to help them to overcome those errors. Every sane person knows that something is deeply wrong with the world. But it is one thing for people to realize that there is a problem, and something very different to precisely *locate the cause* of the problem, in the deficiency in their own thinking and that of others.

The case of John Von Neumann

Now I want to examine the case of John Von Neumann, co-author of the famous *Theory of Games and Economic Behavior* of 1943, as an extreme—and therefore usefully illustrative—example of the type of systematic error which pervades the thinking of leading institutions all over the world in the making of economic policies. This book was hailed as a revolutionary breakthrough in the application of mathematics to the so-called human sciences, including economics, sociology, and psychology. It went together with the

LaRouche: 'I am definitely not a John Von Neumann'

In his autobiography, The Power of Reason: 1988, Lyndon H. LaRouche, Jr. describes the difference between his method and that of John Von Neumann:

I am definitely not a John Von Neumann. According to my sources, he was famed already during his early years, for amazing arithmetic calculations. As in every kindred case of which I know, this development of one's brain as a calculating machine, has certain advantages, but is usually also a grave mental defect. His posthumously published Yale lectures, on the subject of the computer and the brain, display the price he paid for his remarkable talent. My brain has never functioned arithmetically; at no time in my life have I shown better than average arithmetic capacities. My mind functions geometrically, as I believe all minds should, under normal conditions and normal development. By conditioning children's minds in such a way as to emphasize a potential for arithmetical thinking, we cause them to lose much of a capacity which is more fundamental, more valuable.

From what I know of the human brain, including study of the way in which the eye maps into the cortex, human memory is not digital, but holographic. I believe that we "store" experience holographically. I believe that we do not recall experience in the way a digital computer

searches out a stored datum. I believe that we reconstruct an image of experience holographically. . . .

During 1958 and 1959, I returned to the original point of departure for my economic researches, the issue of "information theory."

Over the preceding years, in addition to my attention to what was called "automation," I had studied the efforts to sell the idea that digital computers could be developed to simulate "artificial intelligence." Various theorists, including Wiener and Turing, had helped to build up a credulous audience for such propositions. The influence of John Von Neumann must also take much of the blame for this.

The idea of "artificial intelligence" is readily proven to be an absurd one, but sometimes the work of refuting an absurd idea leads to a useful result. The idea occurred to me: Instead of merely refuting the absurd claim of MIT's Professor Marvin Minsky, et al., why not use the disproof of Minsky's claims as a way of defining the outer limits of capabilities of digital computers? . . .

Every bit of information reflecting an act of communication by, or to, human intelligence, is representable in the adequately extended elaboration of a Gauss-Riemann physics. This signifies that the correct analysis of "information" is uniquely of this form. That fact disproves absolutely the dogmas of Norbert Wiener and John Von Neumann.

The overlay of this line of inquiry with my work in economic science, has been the central feature of my intellectual life since the end of the 1950s, and is the focus of my activities today.

postwar boom in so-called operations research—the method originally developed by the Anglo-Americans to evaluate and perfect the use of bombing of towns and cities for psychological warfare. It was also closely related to the development of information theory and linguistics. We can thank these pioneering efforts for a good deal of the evil which has been perpetrated in the postwar period.

Von Neumann is known as the father of the modern electronic computer (although the mathematical principles involved were well known to Leibniz 250 years earlier). Von Neumann seems to have been obsessed with mathematical formalism and mechanistic forms of lawfulness. He firmly believed that the human brain is essentially nothing but a large digital computer. He devoted great efforts to the design of a self-reproducing machine. His dream was, that by developing ever larger computers, eventually it should be possible to replicate the behavior of any system, living or inanimate. It would only be necessary to introduce a sufficient number of variables. So, it is a short step to the World Bank's RUNS model with its 77,000 parameters.

The basic approach of Von Neumann and Oskar Morgenstern is this. They look at the economy and say, what are the basic elements? These, they say, are the individuals acting in the economy, as workers, businessmen, bankers, and so forth. These are, so to speak, the Newtonian elementary particles of the economy. These interact with each other by making various sorts of trading transactions and deals with each other. Von Neumann and Morgenstern assume that each of these economic "players" has a *system of values* determining what various outcomes are worth to them. Each one tries to maximize its gains and minimize its losses according to some strategy. This criterion defines the action of the so-called market forces.

Note, that there is no principle of *reality* in this so-called model of economics, no morality, no purpose whatever. It is just a game. If anyone would object that something had been left out of the model, the authors could simply answer: No problem! We will just add more parameters!

We find the game theory concept spread everywhere in western society today. Generals conduct exercises in strategy

through computer war games programmed according to some scheme of penalties and gains. The so-called techniques of social conflict resolution, negotiating techniques in business and in trade unions, the modelling and training of marriage and family life through games, and so on and so forth. The entire free market ideology is exactly the same thing.

LaRouche's refutation of Von Neumann

It is very easy to disprove Von Neumann's and any other similar sort of formal mathematical theory of economics, no matter how many variables they set up and how many sets of inequalities and equations are included. LaRouche showed how long ago.

We have only to point out two crucial, historically demonstrated facts concerning Man's existence on this planet.

First, history proves that civilizations which reject scientific and technological progress, are doomed to collapse. So, our western civilization today is sickened and collapsing, because of the anti-science "green" ideology which has been injected into it by the sponsors of the Club of Rome.

The most obvious reason that collapse is inevitable, is the fact that every *human* society—at least every society advancing beyond the stage of half-starved colonies of apes—depends for its continuing physical existence upon some range of physical resources, which will always be relatively finite in terms of the extent to which the society can exploit them based on a given level of technology. Therefore, the moment a society abandons technological progress, it "freezes" the range of its available resources and ensures that, sooner or later, they will effectively be exhausted. At that point, or before—generally long before—the society will collapse to murderously lower levels of population potential.

Observe, however, that the ultimate *cause* of such collapse, of such *entropy*, is not located in Nature per se, but in the society's refusal to continue technological progress at a necessary rate. In other words, the source of entropy is *entropic ideas*.

On the other hand, in spite of the collapse of some civilizations, the broad sweep of history has demonstrated Man's power to successfully expand his power to exist, by means of technological progress, beyond any assignable limits. This power is reflected in the 1,000-fold increase in mankind's population potential on this planet, from pre-historic times until today.

But, what is the nature of this sort of extended, *successful* technological progress?

Let us imagine that at any given historical point of Man's existence, some formalist mathematician like Von Neumann puts all the existing scientific knowledge into the form of an axiomatic system. Now, such a formal system of scientific knowledge defines a range of families of technologies, which are consistent with that system of knowledge. As long as a society holds on to the axioms of such prevailing knowledge, the possibilities of technological progress are strongly limit-

ed, in such a way, that the expansion of population potential will approach an asymptotic limit, and eventually be reversed. At that point, society would be doomed again to entropic collapse.

Hence, *successful* technological progress is based on *scientific revolutions*, in which scientific knowledge leaps beyond the bounds of any given formal system. That is, we discover in effect, and prove by crucial experiment, that some axiom in the system is in disagreement with the demonstrable laws of the universe. This brings down the entire hierarchy of theorems in the formal system and forces us to critically rework the whole fabric of existing scientific knowledge. The effect of such a revolution, from the standpoint of Von Neumann's formal method, is a "jump" from one formal system of knowledge *A* to a new system *B* which is incompatible with *A*.

History demonstrates that Man in fact exists through the power to effect successive revolutions of this type, which open up new ranges of families of technologies of higher productive power. History demonstrates also, that the source of successive scientific revolutions is located immediately in certain ideas known as higher hypotheses. We could call such ideas negentropic or relatively negentropic ideas. Each one implies a seemingly unending series of scientific revolutions $A \rightarrow B \rightarrow C \rightarrow D \dots$

Now we can easily recognize the devastating fallacy of Von Neumann's and every similar approach to economic theory. Exactly the feature which Von Neumann regarded as the strong point of his approach—the supposedly complete formal description of economic processes—ensures that his mathematics could only describe a pathological, entropic form of economy, an economy which has abandoned fundamental scientific progress and is doomed to collapse. For, a healthy economy will always diverge from any mathematical description of Von Neumann's type. In fact, the rate of divergence, the increasing rate of generation of singularities $A \rightarrow B, B \rightarrow C \dots$ is a measure of real economic growth!

Thus, economic value cannot be defined in a formal system. Value is inseparably linked to the power of the human mind to supercede any given formal system of knowledge, by valid scientific discoveries.

The periodic system of elements

Now I want to illustrate the opposite kind of method to that of Von Neumann, by referring to an example of a very successful higher hypothesis, the higher hypothesis embodied in the so-called periodic system of chemical elements, as developed by the great Russian scientist Dmitri Mendeleev beginning around 1869.

I think it is crucially important to emphasize, that the periodic system is not something separate from Mendeleev's role in promoting the ideas of Friedrich List, and his collaboration with Count Sergei Witte; quite the opposite, they are two inseparable facets of the same thing. I would

say more: There could be no American System of economics and there could never have been one, without Mendeleyev's periodic system, or its precursors in the work of (for example) Leibniz, Lavoisier, Ampère, Gauss, Weber, and others. Actually, the underlying species of higher hypothesis involved is developed out of Plato's *Timaeus*, in a line of work extending through the harmonics of St. Augustine, Nicolaus of Cusa's conception of universal evolution, and of course Johannes Kepler.

Therefore, we must view the periodic system of Mendeleyev not merely as a powerful tool of chemistry and physics, but implicitly as a central element in an economic Grand Design, a plan for development of the world economy. In some respects, the Eurasian-wide scientific collaboration around Mendeleyev's work is very similar to what Lyndon LaRouche was putting together in connection with the Strategic Defense Initiative.

Let me briefly elaborate some of this.

Most of you will remember that by working out his system in the form of the Periodic Table, Mendeleyev demonstrated the existence of a harmonic ordering among the chemical elements; and in particular the recurrence, in cycles, of similar or analogous characteristics among the elements arranged in the table. The table itself is actually only a metaphor for what we might today call a quantum field, whose action is reflected in the harmonic ordering of the table.

Now, from the very beginning, Mendeleyev emphasized that the system was not to be seen as a static, formal entity, but as a self-evolving tool of discovery. And Mendeleyev himself demonstrated how that works. The most important thing about the table was the *gaps*, the unfilled spaces, where the harmonic ordering demanded there must be an element, but no corresponding element was known. Using his periodic law, Mendeleyev predicted the characteristics of several of the unknown elements, just as Kepler once predicted the existence of an unknown planet between Mars and Jupiter. Subsequently the elements predicted by Mendeleyev were found, and demonstrated to be in agreement with Mendeleyev's projections. Later, Mendeleyev and others made further projections, and more elements were discovered.

Now, each time a new element was discovered, the entire Periodic Table, and physical chemistry as a whole, were in effect *redefined*. The most obvious example of this process was the series of scientific revolutions growing out of the discovery of the radioactive elements radium and polonium, by Marie and Pierre Curie. This led finally to the discovery of nuclear fission, of elements beyond uranium, and to a vast expansion of the periodic system to embrace the newly discovered degree of freedom expressed by the isotopes. By that, in effect an entire new range of "unfilled spaces" is created for discovery of "new chemical individuals," as they were called by Ida Noddack.

The most important thing, thus, was not the newly discovered elements per se, but the entire chains of advances in

knowledge unleashed "around and between" the new elements. The point is, the properties of the new elements are not *formally, logically* determined by the Periodic Table, in the way Von Neumann would have liked, but represent regions of singularity, regions of potential for scientific discovery. Thus, we know we can always project the process of discovery into the future. We cannot predict exactly what we shall discover, but we have a kind of lower estimate for each step; and, usually, we learn much more than we expected.

Some of you may already notice the similarity with the way in which the process of poetic, musical composition defines a harmonically ordered space in which singularities—dissonances—are generated, whose resolution redefines the meaning of the whole composition and opens up new potentialities for the further lawful development of the composition.

Now, the process of discovery associated with Mendeleyev's periodic system, was inseparable from the rapid industrial and technological development taking place in Central Europe and Russia (with significant ups and downs, of course), from the middle of the nineteenth century into the early part of this century. This industrial growth provided the context for pushing knowledge and technology systematically to their limits, locating new singularities coherent with the periodic system. And conversely, the resulting scientific advances led to increases in the technology and productivity of labor, leading to a new cycle of economic activity and an expanded potential for making new discoveries. We have, in a sense, a negentropy machine. That is actually what Mendeleyev's higher hypothesis really is; its subject is not really the chemical elements, but rather a process-gestalt of development of physical economy which continually projects itself further into the future. The chemical "individuals" are just singularities in that process.

Economics and immortality

Now I would like in closing to return to Von Neumann's error from a psychological point of view. It is interesting to note, that Von Neumann's error could not merely have been an intellectual error. A decade before Von Neumann elaborated his game theory of economics, Kurt Gödel had demonstrated that the attempt to formalize human knowledge in a comprehensive way—even in the domain of so-called pure mathematics—is doomed to failure. Nevertheless, Von Neumann and Morgenstern went ahead, simply ignoring the implications of Gödel's work. Evidently, Von Neumann had an obsession with eliminating any trace of the creative powers of the human mind. This circumstance points to the fact, that it is impossible to competently address the basic principles of economics, without touching upon the most personal and most profoundly emotional areas of our mental life.

Each of us here in this room, and every human being, is going to die some day. In fact, on the scale of history, our individual life seems like a mere instant, nearly absurdly

short. It sometimes seems as if, by the time we really get started, the end is already not so far away. What is the meaning, then, of our life, when it is over? When all the pleasures and personal satisfactions we may have experienced are gone? Was our life just a momentary perturbation in the universe, like a pebble thrown into the ocean, whose little waves spread out, weaken, and finally disappear, and are soon forgotten as if we had never existed? That thought might drive us to suicidal despair. And so indeed, the passionate desire for some form of *immortality*, for some *value* and *meaning* for our lives that might survive our biological death, is among the strongest emotional forces which energize, whether consciously or otherwise, all our thoughts and actions.

Insofar as we might search for a kind of immortality in *this* world, our thoughts turn inevitably to future generations of human beings, to our children and children's children, to the possible meaning of our life for the human society which lives on after us. That takes us to the very core of economics. Let us consider two culturally shaped directions of attitudes to this problem:

On the one hand, we have the oligarchical concept of immortality, based on lineage and breeding, on the biological reproduction of a chosen selection of families, and the perpetuation of their political rule over society, through such institutional devices as the Venetian *fondi*. This idea of a system of perpetual oligarchical rule is the paradigm of a self-perpetuating formal axiomatic system, and the ultimate historical source of the kind of formalist obsession displayed by Von Neumann et al. But it is, in its inner nature, profoundly fascist. In essence, it amounts to pathological form of religious belief. This is exactly what we find expressed in the blood and soil religion of Nazi ideologue Alfred Rosenberg's *The Myth of the Twentieth Century*. The nasty truth is that the Anglo-American oligarchy, as all oligarchies generally, shared essentially the underlying belief structure of the Nazi inner elite.

Opposed to this is the concept which has been happily widespread in western Christian civilization, which is commonly expressed by the idea, that each of us should strive to leave the world a better place than it would have been, had we not lived; that, as a result of our contribution, our children and our neighbors' children and our grandchildren should not only have the possibility of a better or fuller life than we, but that they should in some sense be better people, be less imperfect than we have been. But this commonplace formulation poses the question, how can we *know*, by what criteria could we judge, to what extent we are making an immortal contribution to future generations?

Exactly at this point LaRouche, in his alternative to the incompetence of Von Neumann et al., developed the most beautiful and profound conception, of the power function. It is the *type* of conception which the oligarchical mind is incapable of understanding.

Look at this problem first from the standpoint of knowledge, from Nicolaus of Cusa's principle of *Docta Ignorantia* [learned ignorance], and the seeming paradox he confronts us with there. On the one hand, Nicolaus demonstrates that all positive human knowledge is necessarily flawed, that truth in its completeness can never be grasped by the human mind. Here we meet, in another guise, our mortality, our finiteness. But at the same time, Nicolaus insists that our search for truth is not in vain, and there is a way to actually reach the goal and taste perfection.

The resolution of the paradox is indicated in Nicolaus's discoveries concerning the quadrature of the circle, the relationship between the circle and the finite polygons which the circle bounds externally.

Positive knowledge, of the type of the individual terms in the series $A, B, C \dots$ is of the nature of the polygons, which can never reach the relative perfection of the circle. But we can have more than that kind of knowledge. For example, we can know perfectible principles for generating knowledge, *higher hypotheses* that generate successive scientific revolutions $A \rightarrow B, B \rightarrow C, C \rightarrow D$, etc. These negentropic types of ideas, as we saw, cannot be expressed in the linear sort of language typified by Von Neumann's formal systems; nevertheless, they are knowable to human reason, and communicable through the method of metaphor.

It would appear, therefore, that knowledge of a higher hypothesis already constitutes a kind of infinite knowledge, something at least infinitely more perfect than any individual level of knowledge A, B, C , etc.

But, let us ask ourselves a provocative question: If I have a valid higher hypothesis, which generates successive scientific revolutions, doesn't that mean that I *already* have, implicitly, *all* the positive knowledge contained in that—infinite!—series of revolutions, even *before* they are made? Well, not exactly. For, a higher hypothesis does not, by itself, as a mere abstract idea, generate anything. Scientific revolutions are made by *people*, by individual *human beings*, whose creative activity is guided by the higher hypothesis as a method of discovery. Therefore, I must provide for the continued existence of the *human society* which produces the individuals who make the discoveries, and the overall social process within which such discoveries are realized.

That means not only the simple biological maintenance of human beings. To continue scientific progress over the long term, we require a form of economic development, which accords with the set of fundamental constraints prescribed by LaRouche. For example, development must be energy- and capital-intensive; there must be continual increases in the quantity and technological quality of energy consumption per capita and per square kilometer. The quantity and quality of market baskets of consumer and capital goods must increase, education levels and longevity must improve, and so forth. An economy developing in such a capital- and energy-intensive mode, becomes in effect a gi-

gantic scientific laboratory, because it is constantly driving existing science and technology to their limits, permitting us and the coming generations to successively conceptualize and overcome the limitations of our thinking.

By this means only, can we overcome the finiteness, the imperfection of our own immediate mental activity. A zero-growth economy creates a stupid population, a population of idiots. That is exactly what we are experiencing in Europe and the United States today, where the game-playing society of Norbert Wiener and Von Neumann has taken over. Most of the people do not even notice that they have become stupid.

We overcome our finiteness, our mortality, not by concentrating on our own development *per se*, but by devoting ourselves to the future generations of individuals whose average creative powers will be greater than our own. Our contribution is measured, ultimately, in terms of changes in the rates of increase of the potential density and per capita power of such individuals, per capita and per square kilometer.

So, by Mendeleev's contribution of a more powerful higher hypothesis, he effectively extends his own creative activity to include—in advance!—that of future generations of discoverers, of entire societies in the future. By participating in that kind of process, you and I become, through the creative activity of those future generations, in a sense infinite beings. Each and every person, in the past, present and future, is an expansion of our powers to know the universe, is a contribution to our potential immortality.

Contrary to the ridiculous assumptions of free-market ideology and Von Neumann's game theory, the ultimate cause of *demand* in a healthy society is the *cultural impulse* to realize to the fullest the creative potential of each member of society, today and for the future. Such a society invests its surplus in order to maximize the *sustained* rate of scientific and technological progress, in accordance with LaRouche's constraints. The process of projecting priority areas for investment and research in such an economy, is very much analogous to what Mendeleev did with his periodic system. The next higher accessible rate of rate of increase of potential population density defines, relative to the constraints, sets of harmonic values in terms of which we can define crucial areas of scientific and technological development and new qualities of labor power to be brought into existence. We steer the pattern of demand, against the irrationality of so-called market forces, by setting corresponding investment priorities for the state and private banking sectors.

So, we have at the very basis of economy, a very extraordinary concept, as we would say in Germany, an *unheimlich* sort of conception: an unlimited, self-generating, self-sustaining development powered by the process of perfection of the human mind, in which each human life enriches the life of every other human being, in a unique and individual way.

The process of *knowing* the universe, and the process of generating the physical basis for human existence at ever higher levels, are one and the same thing. Economy is epistemology!

Mendeleev's role in developing Russia

by Victor V. Petrenko

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In the annals of science, the name of Dmitri Mendeleev (1834-1907) stands alongside those of Leibniz, Gauss, Newton, Lavoisier, Faraday, Riemann, Liebig, Planck, and Einstein. Mendeleev's discovery of the Periodic Law (1869-70) became a turning point in the systematization of chemical facts and the development of chemical science.

To comprehend what Mendeleev accomplished, let us imagine a certain strict geometrical pattern made up of small mosaics (this would be the Periodic Table, showing the relations of the chemical elements); we then remove approximately 30% of the pieces at random and hide them (these would be the elements unknown in Mendeleev's day); and finally we scramble up all the remaining pieces (this represents the absence of any valid system accounting for all empirical facts which were then known) and change the color of some of them (some of the "facts" were erroneous). The task is to hypothesize the original pattern on the basis of the pieces (facts) available.

What allowed Mendeleev to discover this objective regularity was the hypothesis of the higher hypothesis. He was not afraid to assert that some of the known values for elements' atomic weights were erroneous, and proposed new, true figures. Before his discovery, chemists were "blind" in their research activity. Most experiments were chosen at random or by intuition. But with the development of the Periodic Law, Mendeleev was able to forecast the existence of three hitherto unknown elements, as well as their properties, the properties of their compounds, and the minerals where these elements could be found. When the French chemist Lecoq de Boisbaudran in 1875 discovered one of the elements, gallium, and defined its physical properties, Mendeleev sent him a letter pointing out an error in the values obtained and asking de Boisbaudran to repeat the measurements. After new experiments, the correctness of Mendeleev's figures was proven. Mendeleev's name is now on the Periodic Table forever: Chemical element number 101 bears his name.

The development of industry

Mendeleev was not merely a scientist. According to the precise description of the Russian chemist Chugayev,