Editor's Note (Toru Nakagawa, December 5, 2002)

This is a personal report of ETRIA Conference held a month ago. (See ETRIA Official Web site and ENSIAS' conference Web site.) About 80 people attended at the conference and presented/discussed a wide range of TRIZ research and applications. Summarising and reviewing important papers and activities in these conferences should be of interest and worthy to learn to many readers, I suppose. (This kind of needs are especially high in Japan, because I was the only participant from Japan this time as well as last year.) Hence, every time I attended at an international TRIZ conference since the one held near Los Angeles in November 1998, I wrote a personal report of the conference and posted it in my Web site (See TRIZCON2001 and ETRIA2001). I have now written and am posting this report in my Web site. Even though I am trying my best to understand and review the papers in fair ways, please regard this as a personal view and please correct me if there is any mistake/misunderstanding in this report.

Conference Name: ETRIA World Conference: TRIZ Future 2002
Date: November 6-8, 2002
Place: ENSAIS (Ecole Nationale Superieure des Arts et Industries de Strasbourg), Strasbourg, France
Held by: European TRIZ Association (ETRIA)
Supported by: ENSAIS, LRPS (Laboratoire de Recherches en Productique de Strasbourg, of ENSAIS); TRIZ Association France, Strasbourg City Community, Bas-Rhin General Council, Alsace Regional Council, The LeGrand Society.
Participants: about 80 people from 16 countries

Outline of the Agenda: 6 Keynote Speaches at plenary sessions and 35 presentations in double tracks from 8:45 through 17:30 for the three days.

Agenda: (In the order of actual presentation. The number in [ ] stands for the paper number in the Proceedings. See the table of contents of the Proceedings at the bottom of this report. *: attended at by Nakagawa.)

Opening
  Keynote 1: L. Komarcheva [1]*
  Keynote 2: A. Nesterenko [2]*

Morning
  TRIZ contribution to other sciences
  N. Shpakovsky, V. Lenyashin, et al. [3]
  N. Kozyreva [8]
  Keynote 3: P. Donnadieu *
  TRIZ contribution to other sciences
  V. Hoch, A. Karlov, et al. [5]
  D. Oget and M. Sonntag [6]
  D. Marsh, D. Mann, et al. [9]*
  N. Kozyreva [36]

Afternoon
  TRIZ's applications and cases
  G. Poppe and B. Gras [24]*
  I.G. Devoino and A.I. Skuratovich [17]*

Evening
  Welcoming reception (Strasbourg City Hall Annex)*
  Keynote 4: Y. Salmatov [35]*
  TRIZ contribution to other sciences
  J. Vincent [10]*
  N. R. Bogatyreva [12]
  N. Kozyreva [7]
O. Bogatyreva [4]
Overview:

This is the second World Conference on TRIZ organized by ETRIA (European TRIZ Association). The first one was held at the University of Bath, UK (see my personal report at my Web site, which was reposted in ETRIA’s Web site). This year, the French school organized the conference at Strasbourg.

The laboratory LRPS of ENSAIS at Strasbourg is certainly the strongest TRIZ group in Western Europe at moment. Professor Roland De Guio, Dr. Denis Cavallucci, Dr. Philippe Lutz, Dr. Nikolai Khomenko, Mr. Dmitry Kucharavy, and many other researchers/staffs/graduate students (about 30 members in total) are working together in the theoretical development of TRIZ and TRIZ applications in various fields including mechanics, automation, science of education, psychology science, management, economy, etc. (See their Web site: http://www-ensais.u-strasbg.fr/triz/)

The total number of participants was near 80 (the list of participants distributed on the third morning contain 62 persons, and we should add 4 invited speakers from Russia and more than 10 ENSAIS people). Participants came from the following 16 countries (according to my counting with the list): France (18 + 10 or more), Germany (11), UK (7), USA (5), Austria (4), Russia (4), Belarus (3), The Netherlands (3), Belgium (2), Czech Republic (2), Korea (2), Ireland (1), Estonia (1), Ukraine (1), China (Hong Kong) (1) and Japan (1).

One most important motive of the present conference was the communication between Western TRIZ community and the original Russian-speaking TRIZ community. Thus the conference invited four keynote speakers from Russia: Ms. Larissa Komarcheva (Mr. Altshuller’s daughter-in-law) [1], Ms. Alla Nesterenko [2], Mr. Mikael Rubin [14], and Dr. Yuri Salamatov [35]. Several more researchers and practitioners came from former USSR countries. And nearly ten of the current TRIZ leaders in Western Europe were originally from the ex-USSR regions. Thus the four Keynote speeches and several other presentations were given in Russian and translated into English (paragraph by paragraph); and English presentations and discussions were simultaneously translated into Russian with wireless headphones.

Keynote speeches were given for 60 minutes in plenary sessions while ordinary presentations for 30 minutes in two-track parallel sessions. The organizing committee says there was over 70 proposals of contributions and 52 of them were accepted for presentation. Cancellation of the presentations was very few, with much improvement from the conference last year.

The proceedings have 402 pages containing the 52 papers (7 of them were arranged as Appendix.) In some of the papers some special symbols were printed in erroneous marks due to the missing in fonts. Appendix of the paper by Nakagawa et al. was missing in the proceedings and distributed separately [53] at the conference. The Proceedings are available through the ENSAIS’ Web site for 60 Euro.

Topics of the presentations cover a wide range. The organizing committee arranged the program in the categories as shown in the above table of Agenda. In this Personal Report, I am going to review them in the following groups:

(A) Keynote Speeches and related presentations by Russian/Belarussian Researchers

(B) TRIZ Contributions to Other Sciences (especially Biology)

(C) TRIZ Case Studies and TRIZ Methodologies for Industries

(D) Trends of Evolutions of Technical Systems and Their Applications

(E) TRIZ in Business, Social Relationship, Education, etc.

The topics presented by Russian speakers are much different from most by the Western speakers reflecting their more advanced phases of TRIZ development in theory and in practice.

In the following I am going to review most of the papers. However, since I attended only half of the presentations and read most of the papers only after the conference, it was rather difficult for me to understand them in their heart.
(A) Keynote Speeches and Related Presentations by Russian/Belarussian Researchers

Keynote Speech by Larissa Komarcheva (Russia) [1] talks on Altshuller's heritage. Mr. Genrich S. Altshuller, the Founder of TRIZ, left his family (his widow, Mrs. Valentina N. Zhuravleva, and his daughter-in-law Mrs. Larissa Komarcheva, and his granddaughter Yuna Komarcheva) a huge archive of published and unpublished materials. They contain unfinished books on the development of creative imagination, papers about teaching TRIZ to schoolchildren, his memoirs, etc. His family is working to make various unfinished materials ready for publication in Russian. She also points out that although Altshuller's books in 1970s and early 1980s were translated into English and several other languages, his latest books such as "To Find an Idea" and "How to Become a Genius" have not been translated into any language yet. She says the Altshuller family is always willing to make Altshuller's work public as much as possible. [See the photo and story of the Altshuller family in Nakagawa's "Report of a Personal Trip to TRIZ Mother Countries, Russia and Belarus, August 1999"].

Keynote Speech by Alla Nesterenko (Russia) [2] talks about her 10-year experiment of introducing TRIZ in the school education program. She has been teaching one class for 10 sequential years in School No. 30 in Petrozavodsk, Russia. The goal of the education is to develop a creative personality, i.e. "a student who can notice, is psychologically ready and is able to solve problems in different fields of human activity". The curriculum includes interdisciplinary courses of TRIZ in technology and of TRIZ in humanities, and also various school subjects based on TRIZ. She encouraged her pupils to "discover TRIZ" for themselves. For problem solving activities, she found regular class-lessons not suitable enough and thus organized exploratory project work as the main extracurricular activity of the class. She has developed a number of course materials. But she says that instead of the course materials themselves she would rather recommend the descriptions of models and technologies. [I understand her point. But for us it is difficult to see from such documents how she actually teaches. Only after we read her course materials or actually observing her teaching, we will be able to understand her saying in her abstract description.]

Natalia Rubina and Mikhael Rubin (Russia) [13] also reports their experiences of TRIZ-based education. Rubina is teaching classes for secondary education one hour per week. She uses standard TRIZ course materials developed in Moscow for schools. The paper describes the aims and goals of TRIZ-education, theoretical bases, methodical and didactical bases, and organizational basis of the TRIZ-education system. [This paper describes about the framework and is not easy to understand the real situations.] [Natalia Rubina is the author of "Course Materials of the CID Course for Children of Grade 1 through 3", which was posted in English translation in my Web site.]

Nelly Kozyreva (Belarus) gave three related presentations [7, 8, 36]. She has developed a big tabular form having the laws of evolution of technical systems (in the rows) and their corresponding evolution phases (in the columns). When a wide variety of related products are plotted in their appropriate cells in this table, the current evolutionary phase of the product becomes clear at a glance [7]. She used this table in her classes of children with the theme of the toy "Bob of toy" (or called "Vanjka-Vstanjka" in Russia, "tilting doll" in America, "Okiagari Koboshi" in Japan). She showed many patents related to this doll in the world and let the children place the figures of the doll mechanism at their proper cells in the table. Then the children not only could understand evolutions in the doll design of mechanism but also were much stimulated to propose ideas of new unique designs [36]. She brought in the big table and many cards of the toy designs and demonstrated them in the hall; it was really vivid and interesting to learn how she actually teaches children. She is also proposing an "Exhibition of toys-inventions" in entertainment parks [8].

Keynote Speech by Yuri Salamatov (Russia) [35] discusses today's TRIZ and its future from the viewpoint as "an exact science". [Dr. Yuri Salamatov is the author of the textbook: "TRIZ: The Right Solution at the Right Time", Insysce (1999); Japanese translation, Nikkei BP (2000). See Prefaces for the Japanese edition.] He describes several criteria required as a science and says that the TRIZ today is a phenomenological theory based on empirical laws and is not successful yet to make 'creativity as an exact science' despite of Altshuller's expectation. He points out several questions which TRIZ does not answer today. Then, he further goes on to discuss in which direction and how the TRIZ should be developed further. His direction is the formalization of TRIZ-theory. He is working to develop a formal language to model the problems of technical systems and to convert them into solutions in some objective ways. His scheme is represented in the following figure.

In the Appendix of the Proceedings, Salamatov presented four papers for defining Ideality [46], for modeling Initial Situations [47], for representing Conflicts [48], and for representing Evolutions [49]. The paper [35] is certainly a very intensive review of TRIZ as a science with much insights. He says he already has two more textbooks in his brain. [Such textbooks must be interesting, I suppose. Nevertheless, I personally feel that the current needs for TRIZ in the world are more pragmatic. TRIZ in the near future need to be easier to learn and more effective in usage. Though these requirements of easiness and effectiveness seem to be contradictory, they ARE the requirements for the TRIZ today and in the near future, I believe.]

Mikhael Rubin (Russia) gave Keynote Speech [14] and a related presentation [30]. The latter [30] is more basic and important I think. He talks about a general theory of the evolution/development of "Material Systems". With the word of "Material Systems", he
includes all the systems of non-organic, organic, living, social, and social-technical. His theory (TDMS) undertakes to describe the laws common in all these systems and to adapt the laws to these different types of systems. It covers a huge scale of theories related to TRIZ (i.e. theories of Inventive problem solving (TRIZ), Development of technical systems (TDTS), Development of creative personality (TDCP), Evolutionary development of biological and ecological systems, Development of ethnos, society, and civilization, etc.). Basic concepts and several laws common to these "Material Systems" are described [30]. On such a basis he talks in [14] the methods of prognosis of social and socio-technical systems in very large scales. He, together with Altshuller, has applied these methods to many problems, he says. Since the paper [14] is brief and having no example, it is not easy to understand his theory. [I remember Altshuller and Rubin’s paper “What will Happen After the Final Victory?” which was published in English translation in the first issue of the Altshuller Institute’s journal, “Izobretenia” (see http://www.aitriz.org/Downloads/final victory.pdf). It describes drastic images of the future of the human civilization; the wide and deep thoughts in the paper caused me much difficulty to follow and accept their foresights.]

**Keynote Speech by Nikolai Khomenko** (originally Belarus, currently working in Canada and France) and **Dmitry Kucharavy** (originally Belarus, currently France) [39] explains the OTSM-TRIZ problem solving process. OTSM stands for "General Theory of Strong Thinking", which was originated by Altshuller in 1980s and has been further developed by Khomenko and his Minsk group. In [39] he examines the problem solving process and identifies the following steps (or line of solutions): i.e. Initial problem situation description --> Conceptual solution (including Partial conceptual --> Converged conceptual --> Final conceptual solution) --> Prototyped solution --> Implemented solution. This paper describes the scheme so briefly that it is difficult to understand its significance in the real industrial (or other) applications.

All these Keynote speeches (except the one by Khomenko) were presented in Russian and translated into English paragraph by paragraph. The translation was smooth and fluent. However, the talks were the condensation of the results of their 10 or 20 years of research into just 60 minutes (or effectively half of the time), and most of the talks showed no or only few slides. Thus, unfortunately, the talks seemed to pass through our brains and slip off. We wish that Russian TRIZ leaders should pay more attention to make their presentations easier for the audience. [I know that my English speaking is not so good and that memorizing the talk of 30, 60 minutes is impossible for me. Thus recently I am trying to write almost everything, especially the logic and illustrations, in the slides. Reading the slides with some minor insertions is my way of presentation as a non-native speaker in English. See my slides of presentation [44] posted in my Web site.]

**(B) TRIZ Contributions to Other Sciences (especially Biology)**

**Professor Julian Vincent** of the University of Bath (UK) gave a presentation [10] to link TRIZ with biology. His research motive is to study examples of natural biological inventions from the viewpoints of their functions and compare them with technological inventions and TRIZ principles so as to introduce wisdom in biological systems into technologies. This time he examined several mechanisms of periodic motions (including flying, swimming, sound production, and teeth-sharpening). He argues that biological systems have many inventions which technological systems have never imagined yet. "Adaptation" and smart and autonomous ability are such examples, and "individual placement of molecules" is another. (See also his paper in ETRIA2001.)

**Nickolaj Bogatyrev** (Novosibirsk, Russia) [12] is an experimental study of constructing an eco-field with keeping bumblebees. This is an attempt to design sustainable reservation unit for the wild pollinators. For protecting bumblebees from their decrease in natural population, first he made small nature reserves (1-5 hectars) in the agricultural landscape; but the numbers of bumblebees decreased instead of increased. Then with the help of TRIZ principles, he made new 'active-type' nature reserves. Around the bumblebees' nesting zone (with minimal human interference), the fields of crops are arranged in the scheme shown in the figure below. Plants are arranged so as to keep constant non-interruptive blooming sequence during all summer seasons and simultaneous blooming of plants with different flower depths for avoiding competitions among different species of bumblebees. The layout shown in the figure was obtained as an ideal solution with the TRIZ method.

**Olga Bogatyreva** (formally Russia, now UK) [4] is also interesting. She has been studying the ant colonies for more than 20 years, observing individual behavior of ants and their management of ant societies. In the present paper she describes ant societies of 6 different Formica species and proposes 'theoretical sociomimetics'. The most important contradictions for all biological species exist between specialization (being highly adapted) and non-specialization (being adaptable) and between competition and cooperation. Observations of the ant societies revealed ants' solutions to these contradictions in the form of different types of management. They are: "Activation" (like independent foraging in feeding territory), "Controlling" (e.g., in a hierarchically organized team of similar types of ants), "Coordination" (e.g., strict specialization with even morphological changes and castes), and "Governing" (e.g., an old ant, who has performed many different functions in her life, stays on the top of nest cupola and regulates all functions performed outside the nest). These contradiction-solvings are discussed in the TRIZ terms. She also points out that "nested contradictions" (where contradictions exist at different levels and are cross-linked with each other) are newly detected in these socio-biological systems. This paper shows a nice example of the depth and width of TRIZ studies conducted in ex-USSR.

The paper [40] "Enriching TRIZ with Biology" given by **Olga Bogatyreva, Anja-Karina Pahl, and Julian Vincent** (UK) is one of the most important papers in the present Conference. This paper seems to reflect excellent synergy among the three authors who...
recently formed a team in the University of Bath. [This paper was orally given by Pahl without any slide, unfortunately. Thus I realized its importance only two weeks after the Conference.] As I mentioned above, it has been Vincent's research motive to observe mechanisms and functions of plants and animals from viewpoints like the ones we analyze technical systems with TRIZ. This paper re-examines the basis of the systems view and definitions of ‘effects’ and ‘functions’. They first define as:

'A biological system' = a living system that performs functions to realize its goals, while affecting the environment.

'A technical system' = a biological system in which some functions are delegated to technical (non-living) devices.

'Functions of a technical system' = the action needed to achieve the useful/desired future condition.

'A biological/technical effect' = the result of a function of a biological/technical system in a particular environment.

On the basis of these definitions, they have found rules for biological effects and viewpoints to construct the databases of biological effects. They report that they have classified biological functions in an engineering-friendly way in the three-level hierarchy. The following Table shows their classification. They contain 6 'program functions', 26 'goal functions', and 271 'specific functions'.

This classification of functions seems to have established a solid basis for their work to combine biology with technology.

(C) TRIZ Case Studies and TRIZ Methodologies for Industries

Nikolai Shpakovsky et al. (Samsung, Korea) [3] is an excellent paper reporting an on-line TRIZ training system named "TRIZ-trainer". The TRIZ expert group invited from Belarus to Samsung for promoting TRIZ in the company are working very actively. The Abstract of their paper tells that TRIZ is at the beginning of its "growing phase" in Samsung, in the following way:

The process of introducing TRIZ into companies normally starts with solving real production problems by involving TRIZ consultants in this work. After significant results have been obtained and some positive experience has been accumulated in this direction, the company's interest changes. A considerable interest arises in teaching the problem solving methods to the company's employees. The purpose of such training is to improve the technical level of all employees and to prepare a certain number of high-skilled specialists in problem solving with the aid of TRIZ. [Since Samsung is now at such a phase (inserted by Nakagawa),] This paper describes our approach to the training of company's employees, which is realized with the aid of the online training system "TRIZ-trainer" developed and used at SAMSUNG (South Korea).

The training software can be used by all company employees through their intranet. The software contains tutorial materials for the TRIZ problem solving procedure and a large number of examples, more than half of them are their proprietary cases. The tutorial is organized to match with different student levels, from initial level to advanced levels. Their problem solving model is called the "Christmas-tree Model". For each problem the students are guided to the sections of Check problem, Solution analysis, and Solving Procedure. Students can send their answers and questions through the network to the teacher; the TRIZ experts check them and reply to the students individually. This training system helps much to increase the opportunities of TRIZ education. To good, selected students, the training is further provided in the forms of seminars with teachers and of real consulting. The demo version of "TRIZ-trainer" is accessible at http://www.triztrainer.com/.

Pascal Guerry (MGI Coutier, France) [19] describes the case of solving problem for inserting heated plastic parts in a reliable way. The paper reproduces the slides, but they are not clear to understand the problem, mechanism, and solutions for me. The paper says with TRIZ they have found several new concepts, but not publicized in the paper.

Joe Miller and Ellen Domb (USA) [22] reports a Canadian agricultural case of treating flax straws at the farms. Their problem is to give farmers some guidelines for choosing better methods of treating flax straws after taking the oil seeds off. Because of variation of economic situations, advantages of various methods (including selling, feeding cattle, and burning) change with time and with the

http://www.osaka-gu.ac.jp/php/nakagawa/TRIZ/eTRIZ/eforum/eETRIACon2002/eETRIACon2002.html 16-Dec-04 10:00:56
volume the farmers have. Thus they need explicit modeling of causal relationship with time dependence. As experienced consultants, the authors advise to add time-dependent modelling and simulation tools (which are widely available already) to the TRIZ "toolbox", and demonstrate their application.

Gert Poppe and Bart Gras (The Netherlands) [24] reports a real case they solved together with cast-iron producers. For iron-casting, the sand moulds need to be made first by compressing the sands surrounding the mould and then by dividing into two parts. The two parts of sand mould are pressed against the hot iron is cast into the product void. When the iron product is removed from the mould, it usually has "bursrs", which need to be removed later with much man power.

This "bursrs" problem is a long-time and widely known problem in the cast-iron industry. The authors solved this problem with TRIZ. Their solution is universal but surprisingly simple: "Glue the two parts before casting hot iron". Many people in the industry had the "Psychological Inertia" that adding glue to the sand is prohibitive because of damaging the sand for reuse. The point is that the amount of glue can be small because of its thin layer of two dimension in comparison to the bulk. The industry has a lot of knowledge of choosing suitable glue materials, of course.

Denis Cavallucci and Nathalie Gartiser (ENSAIS, France) [33] discusses about the difficulties in diffusing TRIZ in companies. Though TRIZ has been developed and never ceased to astonish us for nearly half a century, the impact of TRIZ and its associated tools in the industrial world today has never been so subject to debate, they say. The authors think the big difference between the TRIZ culture and the conventional corporate culture is the reason for the difficulties in realizing large-scale use of TRIZ. After some analysis and discussions, the authors propose three prospects for the future of TRIZ: (1) To be aware that large-scale theoretical knowledge cannot be integrated into popularized computing tools without the backing of in-depth research, and hence to be aware of disillusionment everywhere. (2) To draw up a set of rules for the practices and methods of adopting TRIZ. Only research for scientific, technological and educational purposes will guarantee TRIZ evolution in line with industrial expectations. (3) Company managers must keep aware that adopting TRIZ requires a cultural change, which must be overcome with patience. [Nakagawa feels that even though the observations in this paper are quite right, we TRIZ promoters should find some more positive means which we should and can do for ourselves.]

Pavel Livotov and Dennis Murnikow (Germany) [43] also discusses how to penetrate TRIZ, with the title "Making the use of TRIZ simple without simplifying TRIZ". The authors observe the contradictions that most companies get acquainted with TRIZ as a methodology or software tool and very seldom use TRIZ in their daily practice later and that the same companies don't abandon TRIZ, trying to find ways of its integration in the corporate innovation process. As the results of experiences, the authors developed customizable TRIZ software tool, named "TriSolver Knowledge Processor". It is a handy web-based knowledge-base tool, the authors say. [The tool is already commercially available from TriSolver Group. But this paper is not clear enough how and in which sense the authors have made the use of TRIZ simple.]

Toru Nakagawa (OGU, Japan), Hideaki Kosha, and Yuji Mihara (Fuji Photo Film, Japan) [44] presented a paper with the title "Reorganizing TRIZ Solution Generation Methods into Simple Five in USIT". It is our basic observation that the huge variety of TRIZ methods and knowledge bases causes the difficulty in learning. Thus we have reorganized all the TRIZ solution generation methods (including Inventive Principles, Inventive Standards, and Trends of Evolution of Technological Systems) into much simpler five methods in USIT (Unified Structured Inventive Thinking). USIT is based on the concepts of Objects-Attributes-Functions and a clear procedure of problem solving. Thus the paper claims that the whole body of TRIZ solution generation techniques can be understood and used in a much simpler, unified, and effective manner with USIT. [The paper [44] and its Appendix (describing the USIT Solution Generation Methods) [53], and further the slides for the presentation (in PDF, 168KB), have been posted in our Web site "TRIZ Home Page in Japan".]

Nakagawa's presentation was scheduled at the real end of the Conference and only one Q&A was allowed because of the shortage in time. Denis Cavallucci asked, "Generally speaking, simplification of something means a loss of information. What do you think of your reorganization?" I replied, "Historically, SIT in Israel was a simplification of TRIZ in such a sense; USIT was the addition of new framework (especially Objects-Attributes-Functions) to SIT and a unification. The present paper reorganizes TRIZ into USIT without loss of essential information. Thus we think USIT is now a simple and unified form of TRIZ in the new generation." After the session Ellen Domb mentioned me that Larry Ball (Honeywell) published his course material of "Breakthrough Thinking" (i.e. "a linearized TRIZ") in the TRIZ Journal (March 2002). I read Ball's paper later and found it really impressive even though his procedural framework is quite different from ours.

Bohuslav Busov and Milanda Bartlova (Tech. Univ. of Brno, Czech Republic) [45] describes the way of transforming the initial problem situation into its "Stones" (i.e. Technical Contradictions) and "Kernels" (i.e. Physical Contradiction). These upstream phases in problem solving are often not easy to teach/learn. The authors describe the transformation procedure step by step. They say that their procedure follows the Russian textbooks written by G.I. Ivanov and A.A. Bystrickij (2000) and by B.I. Goldovodskij and M.I. Vajnerman (1990) (both translated into Czech). [Their explanation is somewhat unfamiliar to me in reading for the first time; so this paper should be worth reading again.]
Igor Devoine and Alexander Skuratovich (Belarus) [17] discuss about rules for applying the trimming method. They specify the problem cases with simple functional analysis diagram and discuss the conditions where one of the objects may be trimmed and examine the problems newly invoked by the trimming action.

Jurgen Jantschgi (Austria) [27] talked about his proposal to the 5th Framework Program of EU, "SME's Innnotool". The coordinating partners will be Univ. of Leoben (Austria), CREAX (UK), and Fraunhofer Institute at Aachen (Germany). It proposes to create a toolbox for innovation management for small and medium-sized companies (SME). In addition to classical TRIZ methods the project is going to include various new methods such as those appearing in Darrell Mann's new textbook "Hands-On Systematic Innovation".

Michael Slocom, Ellen Domb, and Catherine Lundberg (USA) [26] examine the effectiveness of two contradiction-solution methods, i.e. solving Technical Contradictions and solving Physical Contradictsins. They used 319 solved problems, which they accumulated concerning self-heating food containers, as the test cases. Setting three kinds of criteria and handling statistically, they have found that the solutions obtained with the formulation of both contradictions are much better than the ones obtained with the formulation of either one of the contradictions. Avraam Seredinski and Vera Seredinski (originally Russia, currently France) [42] discusses of the usage of Altshuller's Contradiction Matrix. In case of short training time, the instructor should select several most important/relevant Inventive Principles by using the appearing frequency in the Matrix, they suggests. In another case when a problem specifies a vacant cell of the Matrix, the authors advise to use the Principles which are predominant in the specified column and in the specified row. These may be sensible ways which TRIZ practitioners should remember.

(D) Trends of Evolutions of Technical Systems and Their Applications

One of the most important issues in the present Conference was the understanding of the Trends of Evolutions of Technical Systems and their applications especially to directing/developing new corporate products. In this section I will survey nine papers directed to this issue. (See also Mikhael Rubin [14] and Nelly Kozyreva [7][36] already surveyed in section (A).)

Peter Chuksin, Jang Woo Jung, et al (LG Electronics and Samsung, Korea) [16] present the method of historical analysis of engineering systems in prognostic project. They use structural, functional, parametric, and cost-estimation modeling of engineering systems and take the society needs into account. Since they are not allowed to show their results of current product analysis, they demonstrate their method by applying to the analysis of "Gaul Header", i.e. harvesting instruments in ancient days.

Nikolay Shpakovsky, Peter Chuksin and Elena Novitskaya (Korea) [32] present their tool and method for generating and selecting concepts on the basis of trends of evolution of technical systems. They have had experiences of showing a large number of versions of related products/parts along the evolutionary phases in a big multi-dimensional chart (named "Forecasting Map", see ETRIA2001 [12]). They have refined their method and have developed a prototype of a software tool having the program structure as shown in the following figure:

![Basic tree of transformations](image)

The backbone of this method/tool is the "Basic tree of transformations (i.e. evolution)". The tree starts with a monolithic solid 3D object and has the "trunk" of "Segmentation of objects", and each phase in the segmentation law now becomes the starting point for the evolution of other trends. A solid object may evolve along any of the lines of mono-bi-poly, geometrical evolution, segmentation of volume, dynamization, activation, introduction of additional substances, etc. A gas phase in the segmentation line may become the starting point for the evolution along any of the lines of mono-bi-poly, dynamization, activation, introduction of additional substances. In this manner, a universal tree structure of evolution was found and installed in the backbone of the tool. The users of the software work on the visualized "scene" window to manipulate the phase of evolution in the Basic tree and to access various text and image databases which provide guidelines and examples of the evolution.

Hansjuergen Linde, Gunther Herr, et al (WOIS Institute, Germany) [28] present their innovation model and strategies to breakthroughs. In 1975 in the former East Germany, Linde read Altshuller's book, and later he studied mechanical engineering and focused his PhD on invention theory. Then he worked in industry over 15 years and in 1991 became a professor at University of Coburg and founded a consultant company, WOIS Institute. Thus his talk and slides contain so much models and examples in a condensed manner.

They use a spiral model of evolution as the basis (having their own summary of laws of evolution) and recognize characteristic patterns of evolution, such as Dead end street of development, Development barrier (with contradiction), Development by negation of the negation, etc. "WOIS" is the German abbreviation of "Contradiction-Oriented Innovation Strategy". They show a schematized figure of the WOIS process in the following way:

![Spiral model of evolution](image)

Solution Phase
Shifting limits
Since this group has its own long history of TRIZ development, some of their terminologies are different but we can learn a lot from them.

**Ian Mitchell** (Ilford Imaging, UK) and **Darrell Mann** [21] discuss how to identify the limiting contradictions and how to overcome them, by using their real case of continuous manufacturing process. They describe the historical evolution in the photographic-paper manufacturing process, especially the coating process and the drying process. Then they discuss how to find where to make the jumps. Further they discuss three mechanisms for jumping at S-curves; they are Contradictions, Trends of evolution (using the idea of Evolutionary potential), and Knowledge (or Effects). Though the second half of the paper is described not so concretely, due to company secrecy, as the first half, their way of thinking is expressed in a manner easy to follow.

**Barry Winkless** (AMT Ireland, Ireland), **Darrell Mann, et al.** [25] report a Case Study of using TRIZ at a small food equipment company. The initial problem was the improvement of a new air-heating instrument of French fries. To this problem they applied TRIZ; functional analysis, trends and evolutionary potential analysis, super-system perspective of the machine, and evolutionary potential analysis of the business model. This shows the capabilities of TRIZ in a wide range of problems, from near-term, fine detail problems through to longer-term technology direction and high level business strategy issues. They also pointed out the necessity of using TRIZ in a systematic step-by-step process.

**Darrell Mann and Simon Dewulf** (CREAX, UK and Belgium) [41] is another interesting paper for using the Trends of Evolution. This paper is an extension of Darrell Mann's new textbook "Hands-On Systematic Innovation" (CREAX, 2002) and presents several new ideas related to trends of evolution: e.g., radar plot of evolutionary potential, relation to Ideal Final Result, evolutionary potential as a function of time, interaction of evolution, tension to drive innovation, etc. These ideas look minor and trivial at first sight, but can be extended further into useful tools, in a similar manner as Darrell Mann has been doing so far.

**Walter Eversheim, Thomas Breuer, and Markus Grawatsch** (Fraunhofer Inst., Germany) [18] discuss the usage of the Laws of Technical Evolution for the design of new products. For demonstration, they use an example of multi-functional shower in the paper and of coffee maker in the talk. The description in the paper is short and not clear to follow. **Armand Ngassa and Patrick Truchot** (France) [34] survey various tools for assisting the process and knowledge necessary to develop new products. They have proposed a method of using three tools, i.e. Knowledgist, BDF software (Functional Diagram Block), and TechOptimizer. **Anja-Karina Pahl** (UK) [37] discusses about S-curves in various phenomena and argues to regard S-curves as a 2D projection of the 3D cylindrical helix or 3D conical helix.

**(E) TRIZ in Business, Social Relationship, Education, etc.**

**Graham Rawlinson** (UK) [29] is an interesting essay which reveals the nature of "Morality" in the TRIZ terms of system's hierarchy and contradictions. In his summary he writes: "The concepts of levels of solutions, for subsystem, system and super-system offer a sound approach to judgement about solutions, and combined with tools for identification and then removal of contradictions, offer a logical process for the examination of issues which may on the surface seem to be about morality in a higher sense, but in practice can be resolved purely in terms of fitness for purpose at different system levels."

**Dana Marsh** (USA), **Darrell Mann** (UK), and **Faith Waters** (USA) [9] report the application of TRIZ to a social, educational problem. At East Stroudsburg University of Pennsylvania, a group of 20 doctoral students and the Department Chair, Dr. Waters, at the Professional and Secondary Education Department were introduced to TRIZ and applied TRIZ to the problem of education system for homebound students who had been expelled from the public schools. This report describes the way of applying Darrell Mann's "Contradiction Matrix for Business and Management". The Matrix is of size 31x31 (in contrast to Altshuller's 39x39 for technical problems). The first task for applying the Contradiction Matrix for Business is to specialize (or customize) the 31 features for business and management in general into the equivalents for education. Actually, the students developed the "educational equivalents of the 31 Features" for K-12 (i.e. Kindergarten to senior highschool) education and for higher education, separately. Then they used the Contradiction Matrix (of CREAX's software tool) by locating the improved/worsen features and finding the Inventive Principles for Business and Management. With the suggestions of these principles the students found solutions to solve contradictions. One solution is the introduction of a "Virtual Educational Component" in conjunction wit the traditional educational venues. It effectively resolves the identified contradictions. With this finding, the University has already reacted to get budget for realizing the solution, this paper says. This paper must be an interesting real example of applying TRIZ to social problems. 

David Oget and Michel Sonntag (ENSAIS, France) [6] report their observation of the teaching methods in the classes of their colleague TRIZ specialists. They have found that TRIZ teaching is closer to Problem Based Learning than to traditional didactics, but that TRIZ teaching is somewhat different from PBL. The authors suggest the possibility of introducing results of PBL pedagogy into TRIZ education, and mention that in small group teaching some type of group members give influence on other members in the acceptance of TRIZ.

Two papers in the Appendix part of the Proceedings (i.e. not presented orally) are worthy of mentioning here in the subject of TRIZ and education. Anna Korzun (Belarus) [51] discusses about the development of pedagogy by applying TRIZ System Operator, thus revealing the evolution of pedagogy (as the system) and its super- and sub-systems in the time scale from ancient days to the present. In such history of pedagogy, she has found some phenomena which match with the laws of system evolution.

Anatoly Guin (Belarus) [52] discusses the role of school education in the past and in the future. He says since the industrial revolution in 18th century, the industrial society produced a "school-factory", whose goal is to teach people to listen, to act according to an instruction, and to accord one's own actions with that of the collective. Then he discusses how to turn the education to a proper direction, on the basis of his recent book "Technique of Teaching" (1999). He advocates five principles: (1) Principle of free choice by student, with the responsibility balanced. (2) Principle of openness (i.e. not being limited) of the problems. (3) Principle of activity by the students themselves. (4) Principle of the back communication (i.e. feedback). and (5) Principles of ideality (i.e. to use the abilities, knowledge, and interest of the students themselves maximally in the education). These principles seem to be drastic and effective to visualize the future education.

Events and Concluding Remarks

Besides the sessions, we enjoyed a lot of chances of meeting, talking, and discussing during the Conference. Coffee breaks for 30 minutes were scheduled every morning and afternoon, and luches for hour and 45 minutes at the hall near the auditorium. On the eve of the Conference, the Ice-breaking party was held at ENSAIS. On the first evening, all the participants were invited for Welcoming Reception at "Mairie de Strasbourg, Annex" by the supponsors. On the second evening we had delicious Welfare Dinner at Maison Kammerzell, the most famous restaurant in Strasbourg of a wooden building built in the 15th century. Meals were nice of course in France, and we enjoyed much to meet new and old friends coming across the world. It was especially happy for me and my wife to meet many Russian and Belarussian friends again whom we met three years ago on our trip to their TRIZ mother countries.

In the conclusion session, there was an open discussion how we should arrange the presentation sessions in the Conference next year. Single-track vs double-tracks, longer vs shorter presentations, selected vs many presentations, etc. are the conflicts we should think over. Several suggestions were made: open workshops in the evening, many presentations for 20 minutes each, 45-minutes presentations (including 15 minutes for Q&A), introduction of poster sessions, etc.

As briefly reviewed here, the ETRIA 2002 Conference have made so much results not only in research/application issues of TRIZ but only in new and closer cooperative relationships in the TRIZ community and uses in the world. We wish to express sincere thanks to all the people who organized, participated, presented, and supported the Conference, and especially to people at ENSAIS.

Next ETRIA conference, TRIZ Future 2003, was announced to be held in Aahen, Germany, in November, 2002. I wish many TRIZ professionals and users meet in Aahen next year (and at TRIZCON2003 in Philadelphia, USA, next March 16-18, 2003 as well).

List of Papers in the Proceedings

[---: Not presented orally.]

[1] On Altshuller’s Heritage
Larissa Komarcheva

TRIZ’s contribution to other sciences

Alla Nesterenko

Nikolai Shpakovsky, Vassily Lenyashin, Hyo June Kim, Elena Novitskaya

Olga Bogatyreva

[5] Use of the Theory of Causality in the decision of tasks of TRIZ-technologies
V.P. Hoch, A.G. Karlov, V.G. Samokhvalov, Y.M. Skomorovskyy

[6] Cognitive development with TRIZ and Problem Based Learning
David Oget, Michel Sonntag

[7] The table for diagnostic and forecasting of the development of Technical system
Nelly Kozyreva

[8] Capabilities of training adult and children to elements of TRIZ in places of mass rest

http://www.osaka-gu.ac.jp/php/nakagawa/TRIZ/eTRIZ/eforum/eETRIACon2002/eETRIACon2002.html 16-Dec-04 10:00:56
-- Nelly Kozyreva

[9] Using TRIZ to resolve conflicts between Public Educational Institutions and private Cyber-Charter School Initiatives in Pennsylvania
   Dana G. Marsh, Darrell L. Mann, Faith H. Waters

[10] Smart Biomimetic TRIZ
    Julian FV Vincent

    -- Ludmila Semenova

[12] TRIZ – is the Missing Link in Super-organismic Biomimetics
    Nickolaj R. Bogatyrev

    Natalia V. Rubina, Mikael S. Rubin

[14] Future Is Projecting on the basis of TRIZ
    Mikael S. Rubin

[15] Where do we go?
    -- Vissarion Sibiriakov

**TRIZ's applications and cases**

[16] Historical analysis of engineering systems in prognostic project
    P. Chuksin, Jang Woo Jung, Myung Kyu Lee, N. Shpakovsky, E. Novitskaya

[17] Idealization of Engineering Systems through Trimming: Engineering Systems as Technological Processes
    Igor G. Devoino, Alexander I. Skuratovich

[18] Design of New Products by the Laws of Technical Evolution
    Walter Eversheim, Thomas Breuer, Markus Grawatsch

[19] TRIZ in French automotive supplier :MGI COUTIER
    Pascal Guerry

[20] -- cancelled

[21] Overcoming Limiting Contradictions in a Continuous Manufacturing Process
    Ian Mitchell, Darrell Mann

[22] The Importance Of Time Dependence In Functional Modeling
    Joe Miller, Ellen Domb

[23] How to Find and Formulate Contradictions out of the Initial Problem Situation
    -- Hongyul Yoon, Marino Kim

[24] Preventing burrs in iron-casting
    Gert Poppe, Bart Gras

    Barry Winkless, Darrell Mann, Barry O’Connor

[26] Solution Dynamics as a Function of Resolution Method
    Michael S. Slocum, Ellen Domb, Catherine Lundberg

[27] “SME´s innotool”
    Jürgen Jantschgi

[28] INNOWIS and WOIS
    Hansjuergen Linde, Gunther Herr, Andreas Rehklau

[29] TRIZ, Contradictions and Morality
    Graham Rawlinson

    Mikael S. Rubin

[31] Group Interactions of people: Types and Goals
    -- Ludmila Semenova

[32] Tool for generating and selecting concepts on the basis of trends of engineering systems evolution
Nikolay Shpakovsky, Peter Chuksin, Elena Novitskaya

**TRIZ’s corporate strategies**

[33] About difficulties to diffuse TRIZ within a corporate structure  
Denis Cavallucci, Nathalie Gartiser

[34] The link between TRIZ and the functional approach for news concepts generation  
Armand Ngassa, Patrick Truchot

**Observing TRIZ’s future**

[35] TRIZ Today and in the Future  
Yuri Salamatov

[36] Training technique of TRIZ elements with the help of a toy "Bob of toy"  
Nelly Kozyreva

[37] What S-curves Really Are…  
Anja-Karina Pahl

[38] TRIZ is not enough  
Johan Tiesnitsch

**TRIZ’s enhancement**

[39] OTSM-TRIZ Problem Solving Process: Solutions and Their Classification  
Nikolai Khomenko, Dmitry Kucharavy

[40] Enriching TRIZ with Biology  
Olga Bogatyreva, Anja-Karina Pahl, Julian Vincent

Darrell Mann, Simon Dewulf

[42] Altshuller’s matrix from different points of view  
Avraam Seredinski, Vera Seredinski

[43] Making the use of TRIZ simple without simplifying TRIZ!  
Pavel Livotov, Dennis Murnikow

[44] Reorganizing TRIZ Solution Generation Methods into Simple Five in USIT  
Toru Nakagawa, Hideaki Kosha, Yuji Mihara

[45] From Problem to its Stones and Kernels  
Bohuslav Busov, Milada Bartlova

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[46] Method of Definition of Ideality of Technical System  
-- Yuri Salamatov

[47] The Topological Analysis of Inventive (Initial) Situation  
-- Yuri Salamatov

[48] Schemes of Conflicts in Models of Problems  
-- Yuri Salamatov

[49] Systemic Evolution of Technic-Sphere  
-- Yuri Salamatov

[50] Place of TRIZ in Methodology of Innovative Designing  
-- Yuri Salamatov

[51] Using a system operator for revealing some laws of pedagogical systems evolution  
-- Anna Korzun

[52] School-factory will die. What’s on?  
-- Anatoly Guin

[53] USIT Solution Generation Methods  
[Printed separately]  
-- Toru Nakagawa, Hideaki Kosha, Yuji Mihara
Personal Report of ETRIA Conference TRIZ Future 2002 (Nov. 6-8, 2002, Strasbourg, France) (Toru Nakagawa)

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