D'OU VENONS-NOUS? QUI SOMMES-NOUS? OÙ ALLONS-NOUS?

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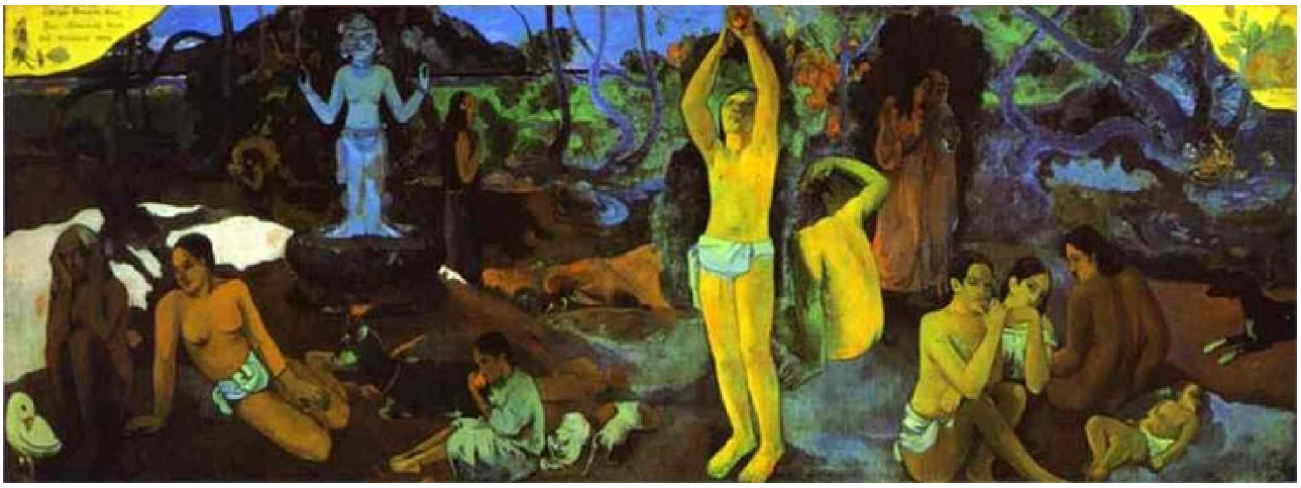
editorial



«D'où venons-nous? Qui sommes-nous? Où allons-nous?», 1897
Gauguin, Paul (1848-1903)

"Who are we? From where? Where are we going?" – this is the title of one of the famous paintings by Paul Gaugin. However, today we will not discuss an art but try to answer the questions: Who are we? From where? Where are we going?

The title of the journal is "Reliability: Theory & Practice"… Is it a good title? Does it reflect the journal profile? Does reliability still take its place of importance in engineering and applied science?

At the closing banquet of the MMR-2004 Conference (Mathematical Methods in Reliability, Santa Fe, USA), Professor Nozer Singpurwalla from George Washington University, the moderator, asked the audience the provocative question: "Is Reliability Theory still alive?" He was given a tidal wave of sharp and nearly angry answers of the kind, "Yes, yes, yes! It is alive!" However, we should be honest: Nozer is right (as usual J) or at least very close to being on point: interest in Reliability Theory is waning….

Some of us who are counted in the ranks of "reliability dinosaurs" still remember the hullabaloo around reliability theory in the beginning of the 1950s, last century.

We recall that in the early phase of the era of reliability, there were many conferences and publications on the topic. The IRE (Institute of Radio Engineers) Reliability Conferences and publications of IRE Transactions on Reliability and Quality Control are just one example.

In the 1960s we saw a real avalanche of papers on reliability… And this pace continues today with the same high intensity!

So, why do we speak about "dying reliability theory?"

The problem, as we see it, is that there is no longer a strong demand for furthering of the theory. First, we recall when and why reliability theory started. It started in the USA just after the Korean War (1950-1953) when too often failures led to serious problems in combat. Then it was realized that analogous problems in reliability existed in civil technical systems. Even as systems became more and more complex, the methodology of their design and construction was the same as it had been for decades before… Thus in the engineering world, reliability became, as it was said at the moment, "Problem Number One." New concepts were needed to develop solutions to this technical problem, but this was not possible without an understanding of the nature of reliability and the creation of mathematical methods and tools to bring these concepts into engineering practice.

So, we see that it was necessity (demand) that caused the field of Reliability Theory to flourish. With time, constructive reliability methods were implemented in engineering practice and successes were achieved. The problem of reliability will exist always, of course; however, we can honestly accept the fact that now it is not "Problem Number One." In addition, so many excellent theoretical approaches have been developed that the requirements of designing "conventional equipment" surely are covered for many years to come.

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However, probably, principally new systems will require new developments Reliability Theory.

At the same time, there are many areas of human activity in which the accumulated knowledge and methodology of Reliability Theory can and have to work.
It is almost impossible to describe completely and correctly in what new activities or areas we should apply Reliability Theory; nevertheless, we will try to describe several important directions where the brains of the reliability community effectively could be applied.

SURVIVABILITY.

Nowadays, we are faced with a new problem of survivability. Natural disasters like the recent hurricane Katrina showed that even a technologically strong country like the USA was unprepared to deal with consequences of a major natural disaster. Moreover, it was clear that preventive measures would be more effective than any measures to help people to evacuate and to reconstruct destroyed infrastructure.

Perhaps even more pressing is survivability related to terrorist attacks. Nobody knows when, where and how those hidden enemies will undertake their evil actions. It is clear that attempts to apply standard reliability methods for the evaluation of effectiveness of undertaken counter-terrorism measures is absolutely unreasonable; though, we note that the methodology of this approach can be useful.

SOFTWARE RELIABILITY.

This is one of the most important areas in modern engineering. Do we need mathematical models for the prediction of software reliability? If so, how will we understand or define the meaning of "failure of software?" Attempts to use blindly concepts of hardware reliability methods on software are doomed to failure, first of all because even if failure is defined, there is no "time to failure" and there is no "probability of failure."

Moreover, considering hardware we have a set of relatively independent items, which have their "individuality" and inherited random properties. Quite a different situation is observed with software. Speaking in language of comparisons, in the first case we deal with a flock of sheep and in the second case we have a set of identical "Mollies", which are absolutely identical genetically…

Probably, software is an object that one should create and analyze a prototype than to try to figure out some mathematical model. We have here the same situation as with unique technical objects, for which, actually, still there is no adequate mathematical models for prediction of their reliability properties.

LONGEVITY.

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Is a computer with longer longevity better? Should we spend money to make its longevity 10 years instead of 5? Let us remember that we change our computers, probably, every 2-3 years. Would we care about 10 years longevity?

Or consider vehicles: many of us change cars after 3-5 years, getting a new or newer one to replace the old one. Used cars often are repaired. Thus, a car owner, has a choice: is it better to buy a new car or a repaired used car or repair the old car? A new type of industry has appeared: car renovation. So, old theoretical approaches in longevity become obsolete.

COMPLEX MULTI-STATE SYSTEMS RELIABILITY.

We are eye-witnesses of yet another period of technological Renaissance: in the last 15-20 years computer and telecommunication sciences and industry have advanced dramatically. We have the World Wide Web; telecommunications has been revolutionized with mobile users, and transportation systems have made crossing international borders … Probably, from outside the manhood is like Stanislav Lem's Solaris: a huge monolith organism with multiple interconnections and coexistence of interdependent units…

We need to survive, so we should study the World we live in; we have to learn how to measure its survivability and what measures we can undertake to assure continued survival.

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