## Invited Plenary Speech

# First Principles Innovation

**Speaker Name,**

Professor Darrell Mann, Systematic Innovation Network

## Speaker Biography:

Over the course of the last 25 years, Darrell has helped deliver over $6B in new value to clients across the world, and has served as the spark behind a dozen spin-out companies. He is the author of over 1000 innovation related papers and articles and a dozen TRIZ-related text-books, the latest pair focusing on innovation in start-up enterprises and the soft-side of innovation. Over the years he has held Visiting Professorships at a range of different universities around the world. He is currently a Professor at the University of Buckingham in the UK.

### Abstract/Outline

First Principles: the result of asking '*how*?' until we can't get any further. If we ask *how* an aeroplane wing works, the experts will tell us it is about generating a lift force greater than the weight of the aircraft. If we ask *how* this lift force is generated, we're told the wings are shaped in such a way as to make air move faster over the top of the wing. If we ask *how* this works, they'll tell us that when air moves faster, its pressure decreases, so that the pressure on the top of the wing is less than the pressure on the bottom of the wing, and that this difference in pressure creates the desired lift force. If we then ask *how* this works, the only remaining answer we're likely to hear from the aerodynamicist's mouth is, 'Bernoulli's Principle'. If we ask 'how' again, most aerodynamicist's will be stumped. Strictly speaking, we could derive Bernoulli's equation from Newton's Second Law, force equals mass times acceleration, but the aerodynamicist has taken, 'capital P equals little p plus half-rho-v-squared' as their first-principle start-point. Ask 'how?' five times and chances are we'll be somewhere close to our own set of first principles.

Not that Altshuller and his colleagues necessarily understood this when they set out to determine the difference between 'good' patents and 'bad' patents. But what they found effectively started the process of revealing the first principles of innovation. By reducing everything down to their fundamentals, they made it possible to take out much of the trial and error out of the innovation process. They discovered that a minimum system demanded 'two substances and a field'. They discovered that contradiction-solving sat at the heart of the process. And, perhaps most importantly of all, that there were only a small number of ways to 'solve' a contradiction once the right one had been revealed. In many ways, TRIZ distilled the innovation process down to its own set of first principles. Or almost. The forty Inventive Principles, we know, contain considerable duplication. Ditto the Inventive Standards. Ditto the Trends of Evolution.

In this plenary address, we will examine the results of an ongoing programme of research to distil not just TRIZ, but all aspects of life down to their true (universal, final, sui generis, indispensable) 'first principle' level. And, having done this, more importantly, we will demonstrate that all knowledge – that which has already been revealed, and that which is still to be revealed – emerges from these principles. By distilling the world down to a coherent set of first principles, we are able to understand that the actual rate of new knowledge generation is infinitesimally small, and that, therefore, it is eminently possible for an individual to learn all that is meaningful in life.