Dream and Reality

Going to the moon and controlling the planet: a dream and a reality, or a reality and a dream?

On glancing through “La planète des espoirs” by Pierre Hafner, I discovered what happened in Geneva during the G8 in 2003 and I told him about my own revolution.

In 1894, August Föppl, whose dream it was to understand the electromagnetic properties of the universe, published at Teubner his book “Einführung in die Maxwellshe Theorie der Elektrizität” which was to inspire Albert Einstein’s first essay, sent to his uncle Cäsar Koch in 1895: “Uber die Untersuchung des Aetherzustandes im Magnetischen Felde”.

In 1897, Föppl completed his body of work at Teubner by publishing “Die Geometrie der Wirbelfelder” as an appendix outlining a mathematical approach to space, and we know what this produced in the hands of Einstein.

In 1909, a former assistant of Föppl, Ludwig Prandtl, whose dream it was to understand the dynamics of fluids, was appointed Director of the newly established Max Plank Institute of Fluid Mechanics in Göttingen. In 1931 he published his course in hydraulics, which was still in use and in its 12th edition in 2010.

In 1989, twenty years after man first stepped on to the moon, at a dinner in Stuttgart, Jay Forrester, who had participated in this epic venture since 1949 at the MIT, explained to me his new dream: the Earth. On this subject, he had set out his ideas on modelling in economics in “Industrial Dynamics” in 1961, on ecology in “Urban Dynamics” in 1969 and on politics in “World Dynamics” in 1971, at a time when the environment and the climate had not yet made the front pages of the newspapers.

In 2011, forty years later, one has to admit that the objective has not been reached despite the advent of information technology and its infinite computing power: science, which has given us space, still cannot integrate our knowledge into a whole that allows us to regulate the planet.

In 1947, Albert Einstein sent a letter of thanks to a young lecturer in civil engineering at the MIT, Henri Paynter, telling him: “I thank you very much that you have called my attention to a mistake in my book” and adding “Furthermore, I am sending you my last two papers. I have exchanged many letters about them with Schrödinger which may have induced him to his latest attempt. You are quite right in your guess concerning his hamiltonian”.

In 1959, again at the MIT, seeing how scientists in the 19th century had used the concept of energy to unify physics and chemistry, Paynter, whose dream it was to control complex technical systems, proposed a graphical language based on energy exchanges to represent dynamic systems in his course “Analysis and Design of Engineering Systems”. From the point of view of artificial intelligence, so dear to Jean Piaget, whose dream it was to formalise intelligence and its evolution, Paynter’s language offered a number of significant advantages: it made it possible to represent very diverse systems simultaneously in a uniform manner, to follow the relations of cause to effect between the variables, to introduce the limits set by the environment and, above all, to be able to control the behaviour of such systems.

In 1972, Anne Borgeaud, a linguist who had studied Political Science, whose dream it was to integrate cognitive psychology and psychoanalysis after being accepted on the team of Mélanie Klein in London, explained to me that she was lacking a theory of emotions based on the four fundamental modalities of thought, as identified over the centuries by western philosophers (knowing, being-able, wanting and having-to) to represent mental energy.

In 1973, with Henri Chenot, whose dream it was to unify western and eastern sciences, we checked that the graphical language of Paynter could be used effectively to represent certain scientific concepts of the East such as the law of the five elements for example. The conclusions of this research were published by Rizzoli in “La dieta energetica” in 1983, a book which today still holds a record for the number of copies printed.

In 1977, Luigi Solari, who developed the new Department of Econometrics at the University of Geneva and whose ideas were published by Masson in “De l’économie qualitative à l’économie quantitative”, confirmed to me during a working session the day before his untimely death that his dream was to make economics an exact science.

In 1986, dreaming of being able to transfer the knowledge of automatic control of engineers to the world of human governance, we experimented with the computerised use of purely logic variables in the context of a postgraduate diploma at the Federal Institute of Technology of Lausanne: “An expert system in automatic control” was used to test if certain sets of logical rules could provide good governance of a dynamic system.

In 1991, I generalised the language, which now contained logic, by using geometric algebra for calculation taking account of the zero and the infinite in spaces with more than three dimensions, such as that for example of the emotions so dear to Anne Borgeaud. These ideas were the subject of a thesis at the Faculty of Economic and Social Science of the University of Geneva: “Un système d’aide à la fixation du prix - Le cas des appels d’offres” described a language that could represent decision making in inextricable situations.

In 1993, at the 20th International Research Seminar in Marketing held jointly by the Institute of Business Administration of the University of Aix-Marseille and the Fondation nationale pour l’enseignement de la gestion des enterprises (National Foundation for Management Education), I presented an example of the ideas from the thesis under the title “Systèmes experts en appels d’offres”. To mark the 20th anniversary of the seminar, the organisers had invited Gary Lilien — whose dream it was to understand the dynamics of markets and who had published “Marketing Decision Making - A Model-Building Approach” with Philip Kotler in 1983 and “Marketing Models” with Philip Kotler and Sridhar Moorthy in 1992 — to give the keynote plenary speech “Marketing Models: Reflections and Predictions” on the development of marketing just before a lunch after which he had to leave France. After presenting an overview of modelling in marketing, Lilien said: “And now, about the future? Gianni showed us yesterday the way we have to follow”, adding before closing the session: “Gianni, if you want, I am free for lunch”. That lunch was on a par with the dinner with Forrester.

In 2000, at the turn of the century, Gérald Mentha, my thesis supervisor, close friend of Jean Piaget, who had explained in “Les causes de décès en Suisse, étudiées à la lumière de la démographie actuelle et de la démographie potentielle”, published by Payot in 1948, why the pension system as it had been introduced was in danger of collapsing around 2010, and whose dream it was to introduce a unit in economics, the “valorie” (see my chapter “L’œuvre scientifique du Professeur Gérald Mentha” in “Mélanges économiques et commerciaux” published in 1992 by the University of Geneva), explained to me why the euro, planned for introduction in 2002, could not last in the form it was conceived: “This would be the first time in human history that a monetary union would hold together without a political union”.

In 2001, some new concepts of the thesis were presented in Phoenix under the title “The bond graph method applied to social and life sciences”, tensor bond graphs and their dimensional analysis, for exemple, during a conference at which Henry Paynter himself expounded these new ideas in a plenary session. Next day, still in Phoenix, a stranger from Zug, who turned out to be the grandson of August Föppl and the nephew of Ludwig Prandtl, by the name of Jean Thoma, a physicist who had undertaken his thesis with Wolfgang Pauli at the Federal Institute of Technology of Zurich, liked Richard Feyman because of his graphs and had received from Henri Atlan confirmation that the language was appropriate for biophysics, as published in “Entre le cristal et la fumée - Essai sur l’organisation du vivant” at Seuil in 1979, suggested that we carry out a graphical synthesis of thermodynamics. It was published in 2006 by Springer: “Simulation with entropy in engineering thermodynamics - Understanding matter and systems with bond graphs”, confirming that the language was universal and opening up the path to multidisciplinarity.

In 2012, when the world’s population could double in the next few years, the UN lists more than a hundred armed conflicts in the world, the G20 is struggling with a severe global crisis, NASA has launched a new exploratory robot to Mars, and, contrary to the notice of the jury, my thesis has still not been published. Who knows why? And however for Mentha, Solari, Paynter, Thoma, Anne and me, it would have been our dream...

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