

ON PROGRESS AND PROVIDENCE

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PREFACE

This little paper is the written version of a short address I was invited to give when receiving a Honorary Degree in Science at the University of Strathclyde in Glasgow.

The form of presentation and the chosen argumentation was tailored to the attending audience of several hundred students receiving their degrees in mostly Science and Engineering, and their relatives.

In fact, I believe that a good engineer should have a clear perception of the metaphysical frame into which he is working, and I am aware that university courses miss that point. When metaphysics comes to the surface, then the engineer is at a loss. Nuclear engineers are learning it the hard way.

ON PROGRESS AND PROVIDENCE*

Sir Samuel kindly asked me to deliver a seven minutes fire-side chat in defense of science. I will use this time to outline my feelings and reflections on the subject and give some methodological hints.

First I would like to give a definition of science slightly different from the current one: to understand it as the exploration of the "external world" by an information system through mutation and selection. Mutation means a slight change in the information pattern of the system, primarily induced internally or stochastically, and selection, a protocol used to check the fit between an internal information system and the external world.

I do not pretend this definition to be very precise; its purpose is to convey the idea of an informational amoeba that gradually and stochastically explores the phase-space around it. Science in the current usage of the word fits this definition perfectly; mutation is meant to be derived from the combinatorial activity of our brains; the protocols for selection (experiments) and coding have been brilliantly defined by Galileo and Newton who, by the way, were the top of the iceberg, an intense intellectual movement at the beginning of the late Middle Ages.

But the same definition finally includes technology, although there the coding of information is more in the form of hardware and know-how. This pushes the beginning of the scientific procedure back perhaps 5000 years when agriculture was first discovered and explored.

Darwin's intuition of the evolutionary concept led to the remarkable discovery that biological systems are structures that, inter alia, gather and store information and operate in very much the same way. This pushes back "science" another four billion years, and one may ask why such a solidly established and splendidly successful methodology should be defended.

There is a disturbing point in what I have said: If all "science" generating systems work in basically the same way, why has science in the modern and current sense nucleated in only

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such a restricted period of time, the early Middle Ages, and extent of space, Western Europe?

The fact is that a complex structure such as a scientific system needs--like a plant--a proper environment, a suitable atmosphere to grow and thrive. Medieval historians, in particular Bruno Benz of Marburg, and Lynn White of the University of California of Los Angeles, strived to penetrate the complex, unexpected, and deep-seated mechanism by which this atmosphere is created.

Deep-seated mechanisms and attitudes operating within a society or a civilization are most often subconscious or subliminal, and one has to analyze language, ethics, and attitudes for their reconstruction. Sometimes they appear as rationalized structures in myth and theology, and at a lower level of abstraction in philosophy. Society, too, appears to operate like a "scientific" system, and these basic options can be assimilated to mutations. Final success will determine their survival value, i.e. their value.

In our society, by daring simplification, the basic ideas or options can be reduced to three, all of which can be traced back to Judeo-Christian roots.

The first is that God created the world. It may sound strange, but this is peculiar to Judaism and Christianity. In most other religions, the world exists in its own right, and Gods, if they are powerful, tend to be part of the machinery. Our God has much of the character of an artisan. He worked hard and competently for six days fitting together progressively the various parts of the fabric. The work completed, he withdrew for a long weekend. This concept and its implications were again fully perceived in the Middle Ages around the year one thousand. God is shown holding scales and compasses, measuring and designing the world with engineering tools. Man, created in his image, was implicitly allowed to take part in the job. This logical consequence was already clear in the biblical tenet that the earth is given for man to dominate, and has been put into action as technological aggressiveness which, under the cover of its moral goodness, progressively developed in the second half of the first millenium. This vision is again peculiar to Judaism, while most other religions, including the Greco-Roman, point to a subtle meshing of man and nature, which is reminiscent of ecological arguments, incorporated in elaborate myths, legends, and taboos.

The second, again of Judeo-Christian origin, is the perception of time as open-ended thus lending uniqueness to the course of history. Uniqueness leads to purposefulness, a cadre very suitable to frame the figure of Christ and Salvation, which would be inevitably belittled in an Indian conception of cyclic cosmic history, even if the cycle is a fairly long one like precisely a billion years. This sense of purpose and the somewhat neurotic preoccupation with time that is characteristic of the West have

been extremely stimulating, engendering persistent activism and aggressiveness. Cosmic purposefulness leads to the deployment of a Great Design St. Augustine embodied in the concept of Providence that brought faith and vigor to its secular version, the concept of Progress.

The third basic idea is the wholesomeness and goodness of manual labor. This principle is neither widespread nor beloved. In most societies, the possibility of avoiding manual labor is a sign of belonging to the upper classes. But a Rabbi has to live by manual labor, and St. Paul, originally a Rabbi, in his preaching and letters injected the concept into Christian ideology. The Benedictine order, under the motto "ora et labora", gave body to the concept and carried it through the centuries in the mostly hostile environment of Greco-Roman tradition. In this frame it is not unnatural that Benedictine convents were a central source and market place of medieval technological innovation. The seed they carried so pertinaciously finally flowered in the friendly environment of democracy where intellectual and manual labor found, if not the same standing, at least a comparable dignity. The situation has only slowly assimilated since engineering--i.e. practical--universities still tend to be kept separate from the "real" ones and slightly frowned upon.

And the seed brought a portentous fruit, an extremely vital and fertile hybrid between science and technology. It seems obvious to us now that they should go together, but it was not obvious at all only a few centuries ago.

The consequences are before our eyes; an explosive growth in activity, wealth, and power, with technologists so taken in by the excitement of the game that they do not find a moment to meditate on the measure and opportunity of their actions and on the fragile metaphysical premises that buttress all their building. We are severely fouling our nest and taxing the learning capacity of society. The wave of discontent and accusation against technology and its companion robber, science, is mounting, and at the same time religious drive and philosophical buttressing are fading. Could that finally lead to an immune rejection? This is not impossible. For the last three centuries of the first millenium the Moslem world was the diamond tip of science and technology, then still separated. Later, around the year one thousand, it consciously and openly renounced progress, refusing even so patently useful devices as the windmill and the printing press. Can we do something to avoid this trap?

Science and technology are two faces of a very general and ancient strategy of interaction with the external world. Its long-term durability and success show it to be a splendid tool. It would be foolish to throw it away just because with the last hundred years, a tiny parcel of time, it has been used imprudently, perhaps because of overenthusiasm. I would plainly propose to put a handle on the tool to control it better, and I end my chat by naming this handle: Wisdom.