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[The lecture of Professor Daumas...]

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It has been pointed out long ago that the clock is the prototype machine. Thus it is the High Technology which interacts strongly with science, but it is only late in its development that this tradition evolves in a form where it transforms the means of production and daily life previously dominated by Low Technology.

V. I. Ostolsky

The lecture of Professor Daumas has drawn the attention of Symposium's participants to one of the most important domains of historico-scientific and historico-technological investigations, to the problem of how arise and how shape the mutual ties between science and technology.

The significance of this still most unsufficiently examined problem hardly needs any particular demonstration. The enormous acceleration of the scientific progress, characteristic of these days, is due — to a large extent — to a constantly increasing interaction and mutual penetration of scientific knowledge and engineer experience. Without carefully considering and retracing the history of the development of those factors, we are unable to rightfully estimate the current events and to establish their actual causes and effects in the sphere of science and production, of economics and social relations.

The cognitive value of Professor Daumas's lecture is quite obvious. His initial theses — the acknowledgment of the groundlessness of the classical opposition between science and technology, the ascertainment of the plurality of spheres of human activities, within the bounds of which science and technology cannot be examined separately, the affirmation of the continuity of links existing between them within the space of the whole history of civilization — will constitute a rational basis for the subsequent research work. However, as particular investigations go on, there should — we think — change and become more exactly defined the particular components of the proposed general conception. So, in the course of such investigations there will more accurately clarify itself the notion of constancy of the direct stimulating influence of technology upon science and will be singled out some groups of natural sciences (for instance, the complex of biological disciplines), whose origin, development and perfection were conditioned by other needs and other necessities of mankind, while the rapprochement to the domain of engineer activities took place only in later periods. Thus, probably, more and more perceptible will be the necessity of detailedly studying the phenomena of the reverse influence exerted by science

on technology — phenomena which are extremely complex and deserve a most particular attention.

The interpretation of those phenomena as expounded in the report, its initial thesis about the prolonged isolation of science, about its excessively high standard and its difficulty for technicians, are — in my opinion — somewhat one-sided and lacking in a suitable correction.

As a matter of fact, the development of science according to the internal logic of the cognitive process outstripped the development of technology, and the enormous scope of problems examined by it was in many respects very wide of the narrow technological interests. But whenever technology passed on to a qualitatively higher stage, the accumulated theoretical knowledge was made use of more and more widely and effectively. At the selection and the concrete application of that knowledge in the production practice, most important became not the trouble about the scientific language being made simple and intelligible to the technicians, not the popularization of scientific achievements, but a real demand for them with the purpose of perfecting the industrial production. It is doubtful whether technology had need of a somewhat simplified explanation of scientific discoveries. Far more important proved to be for it a gradual broadening and strengthening of the collaboration between scientists and engineers, a gradual augmentation of efforts towards overcoming the insufficiency of a general theoretical training of engineers. In becoming free of the ideas and methods of the medieval scholasticism, natural science was consecutively drawing nearer to the domains of applied research, indispensable for the stimulation of the technological process. If, however, retracing the influence of science upon technology proceeded merely from the recognition of such a rapprochement, if, in analysing that influence, we did not take into account, for instance, the enormous significance of organizing technological schools and forming the applied sciences, significance largely exceeding the bounds of the simplicity of scientific language — the due completeness and objectivity of the reconstitution of the history of interaction between science and technology would be hardly realizable.

Let me make, in conclusion, the following remark.

In recent years, regret was not infrequently expressed at difficulties engendered by the "linguistic barriers". There is no reason to dispute those difficulties, just as no necessity exists to reiterate the formerly advanced suggestions as to their elimination. One circumstance, usually not touched in such opinions, is, however, worthy of being mentioned in the very connection with Professor Daumas's lecture. I mean the peculiar "semantic barrier" — the extraordinary disagreements in deciphering the terms "science", "technics", "technology", "technological" (applied) sciences", and so forth. The great complications resulting from

such differences in the course of discussions, of using the foreign literature and making translations from one language to another, involve an imperative and urgent necessity of unifying the terminology. At the realization of this task, best assistance might be rendered, I think, by the International Union of History and Philosophy of Sciences.

J. Sulowski

On ne peut pas présenter le processus du développement des sciences et celui de la technique — ni au cours de toute l'histoire de l'humanité, ni au cours d'une de différentes civilisations — sous une forme de ligne droite qui monte sans cesse en hauteur. On ne peut constater non plus que c'est la courbe qui monte, descend et remonte périodiquement mais s'élève toujours. On peut dire plutôt que chaque civilisation passait des périodes extrêmement actives et des périodes bien stériles, et il est très difficile ou même impossible de nommer et de qualifier tous les facteurs qui coopéraient à l'effet positif ou négatif.

Je voudrais souligner quand même deux aspects de ce développement: l'aspect absolu et l'aspect relatif. Le développement absolu embrasse toute l'humanité qui, de l'état primitif, monte lentement jusqu'à son but. Et, il faut le dire, nous sommes plus proches de ce but que nos ancêtres aux temps les plus reculés. Du point de vue du développement absolu, la civilisation la plus jeune est la plus parfaite. Mais on peut trouver parfois au sein de la civilisation plus ancienne un tas de choses plus perfectionnées, meilleures qu'au sein de la civilisation plus moderne. Il existe alors le développement relatif. Pour bien le comprendre, il faut se rappeller le sort des différentes civilisations ainsi que des rapports entre les civilisations précédentes et succédentes. Tout le monde sait très bien qu'il y avait des civilisations qui ont disparu comme par exemple celles des Aztèques, de Babylone, d'Egypte, de la Crète. Soient-elles sans valeur depuis leur mort pour les successeurs, qui les ont souvent même oublié?

Au cours de l'histoire il y avait des périodes de destruction et de décadence totale, des ruptures dans le développement civilisatrice et l'humanité devait tout commencer de nouveau. Mais, de l'autre côté, même si la civilisation quelconque tombait, en apparence, toute entière, il y restait encore beaucoup de biens de valeur pour des civilisations successives, de liens entre le passé et l'avenir, pour le moment oubliés, mais enfin renaissants. La dernière rupture était plus brutale que toutes les autres, elle a enseveli, il semblait, toute la civilisation du monde antique, entre le IV^{e} et le VIII^{e} siècles. Le Moyen Âge commençait presqu'à zéro. Un certain nombre de livres, quelques monuments