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## About the periodization of the history of science and technology

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Tekst jest udostępniony do wykorzystania w ramach dozwolonego użytku.



*E. Rosen*

## ABOUT THE PERIODIZATION OF THE HISTORY OF SCIENCE AND TECHNOLOGY

The development of science and technology all over the earth throughout the entire course of human history constitutes so vast a process that, in order to be understood in its immense complexity, it must necessarily be divided into periods. Periodization is absolutely indispensable for the teaching of the subject, since without such assistance the student would inevitably be bewildered by the mass of tangled information confronting him. Nevertheless, the subdivision of the evolution of science and technology into constituent periods should not be regarded merely as a useful pedagogical device. The teacher and research historian himself cannot hope to deal successfully with the enormous amount of material available to him unless he introduces into it some scheme of periodization.

Such schemes may be classified as either external or internal. By an "external" scheme, I mean one imported into the history of science from some other more settled discipline, such as political history. By contrast, an "internal" periodization emerges from a study of the development of a particular science, considered by itself. For an example of an external scheme, let me refer to the history of my own country. There it is customary to speak of the "colonial period" in the history of American science, but surely this is a periodization transferred to the history of science from political history. As an example of internal periodization, I would point to the division of the history of observational astronomy into three periods: naked-eye, telescopic, and radio.

It is undoubtedly easier to borrow ready-made categories than to elicit them from the bare facts. But if the history of American science were studied in itself, without any reference to the political background, would the scientific work of Americans, when they were colonial subjects of the British crown, be sufficiently different from the scientific work done in the early years of the new republic to warrant the intro-

duction of a period in the history of American science to coincide with the attainment of political independence from Britain? The achievement of political independence indubitably contributed in the course of time to the advancement of American trade and industry; the desire to destroy obstacles to that advancement unquestionably helped to foster the movement for independence. But were the years 1776 or 1789 genuine turning-points in the history of American science and technology?

Political history is not the only discipline from which a scheme of periodization is imposed on the history of science. In certain circles it is becoming increasingly fashionable, for instance, to speak of the period of baroque mathematics. This expression may originally have been put forward in all innocence as a label for the mathematics produced when baroque architecture was in style. But "baroque mathematics" has come to be taken as the designation of a mathematics which differed from the previous mathematics in the same way as that in which baroque architecture differed from the preceding architectural trend. And this transference has been made without a careful inquiry into the characteristics of the mathematical work being done while the dominant taste in architecture was undergoing the change to baroque.

We have seen how harmful it can be without due caution to carry over to the history of science schemes of periodization that are suitable to other disciplines. We should be equally on guard against periodizations which are put forward for purposes extraneous to the impartial study of the history of science. Thus, a well-known treatise divided the entire history of astronomy into three periods: primitive, Greco-Babylonian, and German (some of the prominent astronomers in the German period being Galileo, Newton, and Laplace). Naturally, this periodization was not received with much enthusiasm in Italy, England, and France. Even in Germany this misuse of periodization for purposes of nationalistic propaganda has not been generally accepted.

A third kind of extraneous pressure affects the slicing of the history of science into separate periods. For example, certain scholars seek to prolong the Middle Ages later and later into the Renaissance, and some have even gone so far as to deny that there was any Renaissance at all. Are these strenuous efforts based solely on historical grounds, or are they perhaps motivated by a desire to safeguard the prestige of the institutions dominant in the Middle Ages? For if indeed there was a Renaissance, then it must have entailed a rebound from a depressed level, and inquiring minds would then be tempted to ask: "Who or what was responsible for the depressing of the scientific level?" The answers to this question might well impair the reputation of forces which are still very powerful in our time.

Whatever the source of a scheme of periodization, whether it be

external or internal, there can be no guarantee that it will fit equally well the history of science and the history of technology. Science and technology are evidently interrelated enterprises. Nevertheless there have been times in human history when their effects upon each other have been less decisive than at present. There have even been epochs when science and technology were scarcely on speaking terms with each other, when the craftsman had no theoretical training and the scientist had no interest in practical problems. A scheme of periodization suitable to science during such an epoch of estrangement between hand and brain could scarcely be expected to fit technology, and *vice versa*.

If we should be on guard against assuming in advance that any scheme of periodization suitable for science would fit technology equally well, we should be equally on guard against assuming that what holds true for one branch of science holds true for all others to the same degree. Would anyone seriously maintain that all the branches of science swung upward in one unified movement at one time, and then reversed their direction and dropped down together? Unfortunately, the tree of scientific knowledge did not grow and droop with such convenient uniformity. Some branches expanded early and rapidly; others remained mere twigs; still others threw out numerous offshoots and flourished mightily. In sober truth, the tree of scientific knowledge looks lop-sided. No one simple uniform pattern of development is discernible in all its branches. No single scheme of periodization fits all the branches of the tree of scientific knowledge.

If the preceding description has not missed its mark, the proper periodization of science and technology remains unfinished business. As a temporary measure, the conventional schemes of periodization now in use may be continued, since some form of periodization is essential. But the conventional schemes, which are mainly external in origin, should be regarded as merely tentative. Meanwhile, the research workers in each field of science and technology should undertake an active quest for the scheme of periodization most appropriate for their field of special interest. If any proposed scheme gains general approval, presumably it will be, not external in origin, but rather internal, arising out of the unique history of that discipline. It will be adopted, not for the sake of convenience, but because it fits the historical facts best. It will not help to promote any one-sided propaganda campaign; for if it did, it would not win widespread approval. It would not consist merely of catchy phrases or fashionable expressions, for it would be based on solid research and it would be designed to endure as the permanent framework for further investigations.

If the foregoing program attracts a sufficient amount of attention on the part of research workers throughout the world, we may some day

see, in all the various fields of science and technology, suitable schemes of periodization proposed, discussed, revised, and adopted. Then it will be time to consider how far such schemes can be generalized, to what extent a scheme originating in one field can be applied to related fields. Perhaps it may even be possible to envisage, as the end result of this process, a scheme of periodization that would be applicable to the totality of science and technology, taken together. Such an all-embracing scheme might bear little, if any, resemblance to the customary periodization. But even if the overarching superstructure should turn out in the end to duplicate, in whole or in part, the conventional schemes now in current use, at least it would have been adopted, not to avoid hard work or to flatter the mighty or would-be mighty, but because it was the best scheme of periodization that could be devised on the basis of honest, unprejudiced research devoted exclusively to furthering the correct understanding of the history of science and technology.