

第五课 “定向” 研究?

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Unit 5

(Revision of material appearing in Units 1-4)

'DIRECTED' RESEARCH?

5 A recent phenomenon in present-day science and technology is the increasing trend towards 'directed' or 'programmed' research; i.e. research whose scope and objectives are predetermined by private or government organizations rather than researchers themselves. Any scientist working for such organizations and investigating in a given field therefore tends to do so in accordance with a plan or programme designed beforehand.

10 At the beginning of the century, however, the situation was quite different. At that time there were no industrial research organizations in the modern sense: the laboratory unit consisted of a few scientists at the most, assisted by one or two technicians, often working with inadequate equipment in unsuitable rooms. Nevertheless, the scientist was free to choose any subject for investigation he liked, since there was no pre-determined programme to which he had to conform.

15 As the century developed, the increasing magnitude and complexity of the problems to be solved and the growing inter-connection of different disciplines made it impossible, in many cases, for the individual scientist to deal with the huge mass of new data, techniques and equipment that were required for carrying out research accurately and efficiently. The increasing scale and scope of the experiments needed to test new hypotheses and develop new techniques and industrial processes led to the setting up of research groups or teams using highly-complicated equipment in elaborately-designed laboratories. Owing to the large sums of money involved, it was then felt essential to direct these human and material resources into specific channels with clearly-defined objectives. In this way it was considered that the quickest and most practical results could be obtained. This, then, was programmed (programmatic) research.

30 One of the effects of this organized and standardized investigation is to cause the scientist to become increasingly involved in applied research (development), especially in the branches of science which seem most likely to have industrial applications. Since private industry and even government departments tend to concentrate on immediate results and show comparatively little interest in long-range investigations, there is a steady shift of scientists from the pure to the applied field, where there are more jobs available, frequently more highly-paid and with better technical facilities than jobs connected with pure research in a university.

40 Owing to the interdependence between pure and applied science (see Unit 4), it is easy to see that this system, if extended too far, carries considerable dangers for the future of science—and not only pure science, but applied science as well.

prehension

- 1 What is programmed research?
- 2 What differences in working conditions are there between

现代科学技术最近出现了一个现象就是：越来越趋向于“定向的”或“有计划的研究”，就是说这些研究的范围和目标是由私人或政府机构确定的，而不是研究者自己确定的。因此任何为这些机构工作并在特定的领域进行研究的科学家都要按照预先制定好的计划方案进行。

然而本世纪初的情况与现在完全不同，那时不存在现代意义上的工业研究机构：一个实验室最多由几个科学家组成，在一两个技术助理的协助下工作，通常他们使用的设备仪器不够好、房间也不怎么合适。尽管这样，科学家可以自由地选择任何自己喜欢探索的研究项目，因为不存在预先制定好的计划要他来遵守。

随着世纪向前发展，需要解决的问题的复杂性和规模越来越大，并且学科之间的相互联系在不断的增加，在许多情况下，要精确和高效率完成科研需要处理巨大量的新数据、使用大量的新技术和新设备，因此科学家要单独完成这一切是不可能的。测试新的假设、开发新技术和工业流程所需要的实验，规模和范围不断扩大，催生出在精心设计的实验室里使用高度复杂的设备的科研团队。由于涉及大量资金，因此人们觉得有必要把这些人力和物力资源归入目标清楚界定的专业渠道，采用这样的方式就可以得到最快和最实用的科研成果，因此这就叫有计划的研究。

这种有组织和标准化研究产生的效果之一就是使得科学家越来越多的涉足应用研究（开发），特别是看起来最可能有工业应用的科学分支。由于私人企业甚至政府部门倾向于关注短期的效果而对长远的研究项目兴趣相对较小，科学家逐步从纯科学转向应用科学领域，因为在应用科学领域比在大学里搞纯科研更容易找到工作，工资更高并且技术设施更好。

由于纯科学与应用科学存在相互依赖的关系（见第四课），很明显如果这种计划科研系统走向极端时将给科学的未来带来极大的危险，不仅仅对纯科学危险，对应用科学也是同样的危险。