trend of lower R&D spending at business and government levels in the EU, compared to the United States and Japan. Europe spends 1.92% of its GDP on R&D compared 2.62% in the US and 2.91% for Japan. Likewise, industry-financed R&D as a percentage of industrial output lags at 1.42% in Europe, versus 2.08% and 2.49% in the USA and Japan respectively. The actual R&D spending gap with the USA widened from €40 billion per year in the middle of the last decade to €75 billion by 1999. The problem of lower funding is aggravated by the fragmented nature of R&D in the EU and its Member States, which results in duplication and lack of coherence of research effort. Limited competition in certain sectors also reduces the incentive for companies to fund research.

The EU has fewer researchers as a proportion of its workforce (5.3%) than the USA (8.1%) or Japan (9.3%). This difference is even more marked in industry. Youth involvement in science is declining and Europe still suffers from a brain drain to the US. In science and in the economy in general, there are skills gaps and mobility problems.

The number of scientific publications per million of population shows the EU (at 613) lagging the US (708) but exceeding Japan (498). The number of publications has been growing at 2.92% in the EU, while in the USA it is dropping. Europe lags in the transformation of research results into proprietary technologies. Only 47% of patents filed in Europe originate in the EU, and a much smaller proportion of patents in the American and Japanese systems are held by Europeans.

Difficulties continue to plague the launch of the new Community-wide EU patent. In addition, seed and start-up venture capital are lacking in Europe, where 0.38 (per 000 GDP) was available, compared with 0.99 in Japan and 1.16 in the USA.

As the knowledge-based economy becomes ever more central to economic and social well-being, Europe seeks to resolve these dilemmas. Thus, in Lisbon in March 2000, the European Council advanced a goal of making Europe the world's most competitive and dynamic knowledge-based economy by 2010, and endorsed the concept of a European Research Area (ERA) to strengthen Europe's research base.

The ERA forms the heart of a strategy involving necessary steps in the following areas: Networking national and joint research programmes on a voluntary basis; improving the environment for private research investment, R&D partnerships and high technology start-ups; developing an open method of coordination for benchmarking national R&D policies; creating a very high-speed trans-European telecommunications network for research; creating a European area in which there is free mobility for researchers, and which is attractive at the international level; and introduction of a simple, effective and inexpensive European Community patent.

Such steps are necessary, in part because the European Union is far from homogeneous -- in language, culture or S&T. Beneath the European trends and statistics lies a mosaic of S&T policies, programs and performance at the Member State level. There are some star performers such as Sweden and Finland, but some members do not shine on the research and innovation scoreboards. The ERA should enable the Union to identify excellence, to strengthen pan-European collaboration and to establish clearer and more consistent priorities for public research.

The proposed inter-governmental open coordination method, through its benchmarking and scoreboards of research, innovation and enterprise, will aid Member States to assess and improve performance. A recent EU-commissioned benchmarking study rated Sweden as a leader in R&D and high technology. The study looked at the research policies of EU nations and