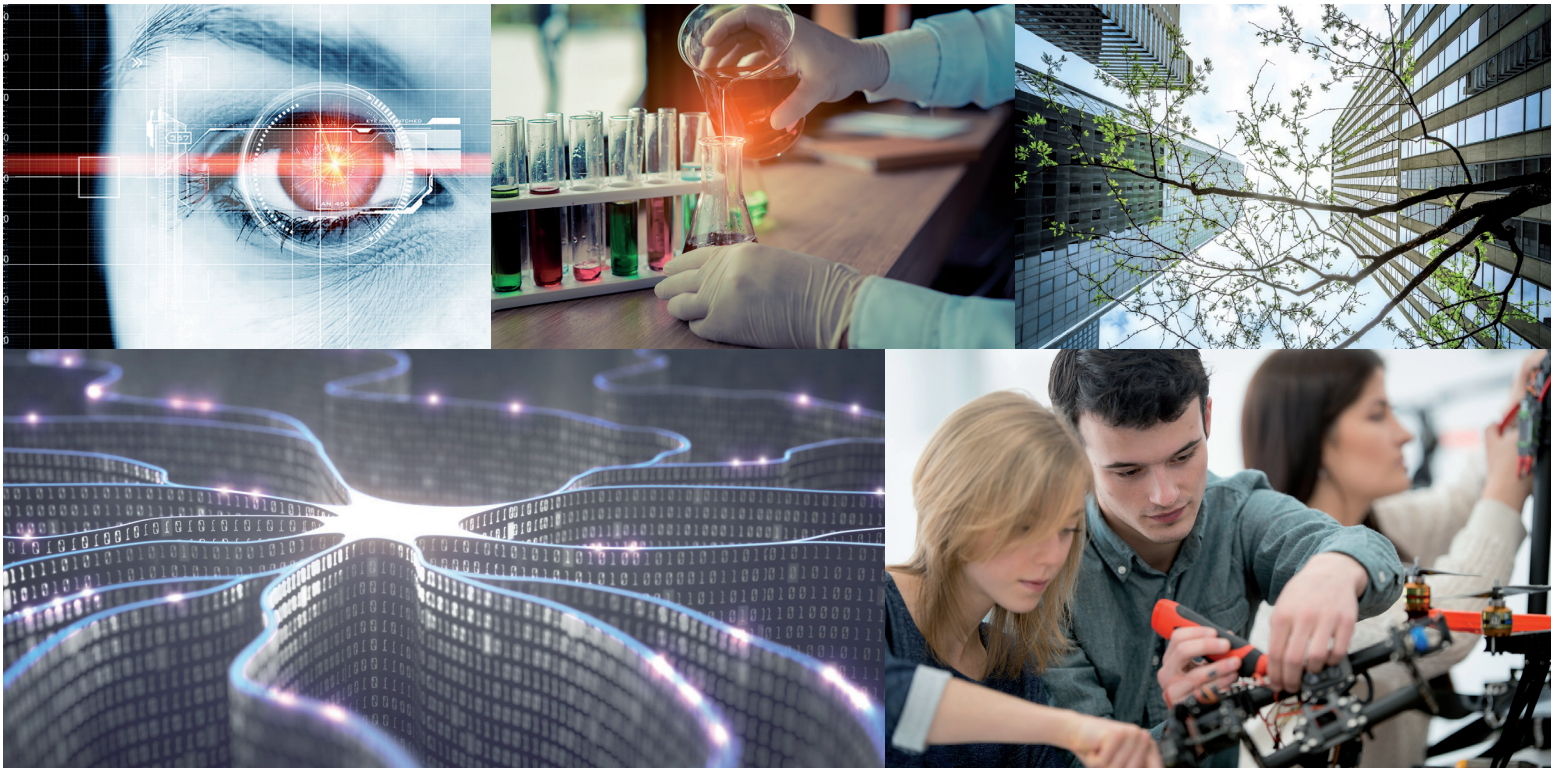


2017

ANNUAL REPORT

The essentials



**NATIONAL ACADEMY OF
TECHNOLOGIES OF FRANCE**

SHARING REASONED, CHOSEN, PROGRESS





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Highlights 2017

JANUARY

- Report
What is the reference price of CO₂?
- Communication
Oil: what reserves, what production and at what prices?
- Debate
(Re)constructing vocational training paths that are as close as possible to the needs of companies - in partnership with the Fabrique de l'industrie.



FEBRUARY

Hearings of the Academy of Technologies' members by French Parliamentary Office for Scientific and Technological Assessments:

the stakes of energy research; public exposure to electromagnetic emissions from connected counters.



MARS

1937 - 2037: a century of technological development

For the 80th anniversary of the Palais de la découverte, an evening-panorama of key technological innovations to meet the essential needs of humanity.

APRIL

Technologies and climate change: solutions for mitigation and adaptation: publication of an addendum on technologies that will contribute to the reduction of greenhouse gas (GHG) emissions and to the adaptation of our economies.



MAY

Academic session on *cybersecurity in France*.

JUNE

- *Science community facing intelligence issues:*
a colloquium organized in partnership with the Académie du renseignement.
- *Nine proposals to the Government on targeted strategic issues and French assets.*

JULY

- *Approach to fundamental learning processes* (Report)
- *Modifying thermal regulation of new buildings to reduce greenhouse gas emissions at the lowest cost* (Notice)
- *A robotics' strategy to reindustrialize France* (Notice)

SEPTEMBER

Signing of a partnership agreement with France Stratégie.

OCTOBER

- *Science and Technology in Society (STS) forum* (Kyoto).
- *Annual seminar on Technologies and territories of innovation.*
- *Robotics and mental health*, a colloquium on the opportunities and risks of using robots as therapeutic aids, organized with the University of Paris Diderot-Paris 7 and the institute for the study of the human robot relationship.

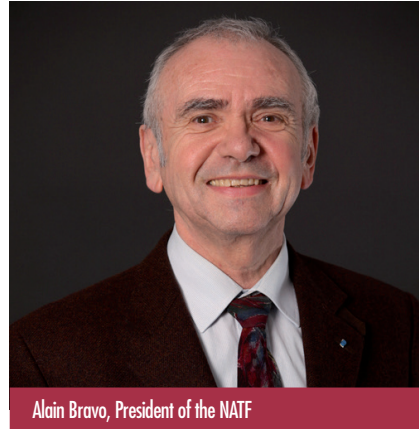
NOVEMBER

- *Industry of the future: from the technical system 4.0 to a social one* (Report). The industry of the future requires radical adaptation of companies and increased efforts in vocational training.
- *Euro-CASE annual conference on the subject of 'Cybersecurity'* (Poland).
- *CAETS annual conference devoted to the bioeconomy* (Madrid).
- *1st annual convention of the Academy of Technology*, dedicated to innovation in the agri-food sector, award ceremony for innovative start-ups and SMEs.

DÉCEMBER

- *National health strategy 2018 – 2022*: proposal to the Government of a programme to preserve a competitive national health industry.
- *Recommendations for developing and enhancing initial and continuing vocational* (Report)
- *Election of twelve new academics.*

Editorial



The year 2017 was a fruitful and intense year for the commissions' work, with the continuation of reflections on the interactions between society and technologies around three axes: industry of the future, training/education and artificial intelligence.

The Academy is strongly involved in the industry of the future and vocational training, with several reports - published this year or in the process of being written - on this subject. The Academy focuses its recommendations on two main issues: vocational training and lifelong learning. Much remains to be done to promote the positive orientation of young people towards vocational education and learning. Lifelong learning is undoubtedly the area that will see the most significant progress, with the dissemination of EdTechs (Education Technologies) which open up the prospect of personalised online training. Investment in these new technologies must be commensurate with the challenges posed by the industry of the future and, more broadly, by the economy of the future.

The Academy held its first annual convention on the theme of innovation in the agri-food sector. On this occasion, three prizes were awarded to start-ups and SMEs.

The creation of the Grand Prix de l'Académie des technologies is the keystone of this policy of promoting innovation, which is one of our missions.

As regards our relations with our main partners in Europe, we have contributed to several reports drawn up under the European Science Advisory Mechanism, which set up the SAPEA (Science Advice for Policy by European Academies) project. SAPEA is run by five European academic networks, including Euro-CASE, whose general secretariat is provided by the Academy.

Internationally, the Academy, a member of the Council of Academies of Engineering and Technological Sciences (CAETS), is developing its cooperation agreements in Asia, the United States and Africa.

After 10 years of existence as a public institution, it was felt necessary to clarify our priorities and strategy for 2025. Hence the establishment, at the end of 2015, of a group to reflect on the Academy's strategic orientations for the next ten years.

New strategic objectives have been identified, confirming the Academy's commitment to its fundamentals: developing our relations with education, the economic world, developing our cooperation in Europe and internationally, doubling our ecosystem of experts and our resources through project funding.

From this reflection was born the project of creating a National House of Technology, on which we are collaborating with the National Association of Research and Technology. This ambition stems from the fact that we in France, it seems to us, lack a showcase of technologies and their contribution to innovation, to the economy and to the well-being of our fellow citizens. It must also be a place where socio-economic actors can debate, make policy recommendations, form partnerships... There are already several such structures in Europe - in Berlin, London, Stockholm... The creation in Paris of a House of Technology for Progress and Innovation would certainly be a political «gesture», a sign of awareness of the fact that new technologies, through their contributions to the ongoing transitions -digital economy, ecology, energy and climate-, are a national issue.

IDENTITY & STRATEGY



OUR COMMITMENTS

The Academy pays attention to the societal dimension of technologies, in particular:

- fully integrating the transformation of society through digital technology;
- fostering the appropriation of technology by society;
- building on innovation ecosystems;
- integrating the brakes into technology deployment. It places ethics at the heart of all its reflections.

The Academy focuses on technologies that will enable France to succeed:

- improvement of health and nutrition of the French people;
- fight against unemployment, including that of young people, through educational transition, education and initial and lifelong technological training to the jobs of the future;

- energy transition to combat climate change;
- digital transformation of all sectors of activity;
- growth of SMEs into mid-sized enterprises (MMEs);
- mobility and transport of tomorrow;
- biotechnology and its economic potential;
- development aid for the least developed countries;
- regional economic development and job creation through technology.
- International cooperation and benchmarking.

STRATEGY 2025

1. Expanding our relations with the economic world

- create a cénacle of business leaders and, in general, develop our relations with business leaders and the economic ecosystem;
- create a National Technology House to strengthen synergies with like-minded organizations;
- strengthen our advisory services to the Government and the administration through drafting of Green Papers or the management of prospective studies;
- develop our cooperation with other academies and the university research system.

2. Strengthening our relations with the world of education and training

- take a position on projects concerning skills, qualifications and lifelong learning in public policies;
- participate in the governance of educational and research institutions and national associations;
- take into account the skills and qualifications needs of companies and professional organisations in our prospective work;
- get involved in regional and Euro-regional initiatives in the territories, organise competitions and award labels for books or training programmes.

3. Strengthening our cooperation in Europe and internationally

- continue to develop our current international partnerships in Europe, Asia, the United States and Africa, involving more academies and seeking project funding;
- more systematically benchmark our work to increase our international visibility, and develop fruitful cooperations.

4. Strengthening governance and developing our expert ecosystem

- evolve the governance by changing the term of office of the elected members to the Academic Council to two years renewable;
- increase the maximum number of full members from 250 to 350;
- double the number of external experts in committees and working groups.

PUBLICATIONS & NOTICES

Texts adopted in 2017

- **What is the reference price of CO₂?**
Notice and report voted on January 11

This report addresses the question of the economic penalty to be attributed to CO₂ emissions: why to set a reference price? How to define it? In practice, what price to adopt?

For the future, France has set itself a percentage reduction target identical to that of countries with significantly higher emitters. As a result, the price of CO₂ for France should be set at a high level, above 50 €/t CO₂ and higher than that of countries at the same level of development. The determination of a reference price alone, or even a tax, will not be sufficient to meet the emission reduction path. It will also have to be accompanied by other incentives, in the form of regulations or subsidies (guaranteed rates, etc.). Establishing a cost per tonne of CO₂ avoided should make possible, depending on the technology used, to further optimise these incentives.

- **Oil: what reserves, what production and at what price?**
Communication approved on 11 January

Despite the necessary reduction in fossil fuel consumption to combat climate change, oil will remain essential for decades to meet the ever-increasing global energy demand. Evolution of markets, techniques and production prospects, geopolitical impacts, scenarios for the future: this publication provides a critical and objective analysis of a sector that too often raises passions and fantasies.

- **The impact on human health of different sources of electric power generation: assessments over the last 50 years**
Communication approved on 10 May

Every source of electrical energy has its own risks. It seemed important to the Academy of Technologies to evaluate them quantitatively and objectively in order to help the authorities to support all the research and innovation efforts that will make possible improving performance and reduce risks for each of the energy sources of very different strategic importance from one country to another, but with global health consequences.

- **Approach to fundamental learning processes**
Report voted on 5 July

How do human beings learn about existing and new technical objects in everyday and professional life, as well as the know-how to make them? This study seeks to highlight, in the learning processes, invariants, evolutions and avenues of progress.

- **Modifying thermal regulation of new buildings to reduce greenhouse gas emissions at the lowest cost**
Notice voted July 5

The Academy of Technologies recommends that regulations should be based on the concept of low emission building (BBE), to avoid the construction of new buildings that will still be present at the end of the century, emitting significant quantities of GHGs: the economic technical solutions (materials, systems and regulations) for this purpose exist for all types of housing, provided that a reasonable base level of annual CO₂ emissions of kg of CO₂ per m² is set for thermal uses.

- **A robotic strategy to reindustrialize France**
Notice voted July 5

The demand for robots finds on the market only foreign supply to satisfy its urgent needs. Yet France has everything it takes to create a world-leading robotics industry. The Academy of Technologies recommends in particular to rely on the structuring role of the Directorate General of Armaments, whose robotic needs would enable it to maintain a strategic normative and qualitative control by purchasing in France.

- **Innovation, growth, employment: the digital revolution and jobs**
Report voted on 13 September

What is the real and sustainable impact of new technologies on employment? A summary report summarizes the conclusions of an internal seminar attended by many economists and economic players in France and Europe.

- **Joint recommendations for the future of nuclear energy**

Report voted on 13 September

At the end of 2016, the Chinese Academy of Engineering and the French Academies - Academy of Technologies and Academy of Sciences - set up a working group to study conditions for the development of nuclear energy. The experts reviewed the different policy and technological options, including safety and waste management, to make nuclear power generation a component of future energy mixes in countries with the appropriate potential for implementing nuclear power. The report addresses several aspects - scientific, technological, sociological and managerial - and makes recommendations to the countries wishing to develop nuclear energy.

This report is available in French, English and Chinese.

- **Industry of the future: from technical system 4.0 to social system**

Report voted on November 8

The aim of this report is to review social challenges facing the industry of the future and responses that can be provided to meet them in companies, in particular, by the territorial training organizations. It deals with conditions for the diffusion of 4.0 technologies in industrial enterprises and examines their effects at various levels of society and organizations. The report also looks at the role of the initial and continuous educational system as well as the positioning of territories and their ecosystems in assuring industry transformation and services to industry.

- **Recommendations for developing and enhancing initial and continuous vocational training**

Report voted on 6 December

The report favours a systemic approach and takes into account both the different actors involved in vocational training at regional, national and international levels and the users - young and active. Several points are analysed: the actions implemented, the articulation between the different actors involved in the training process, the way in which users manage lifelong learning pathways and the difficulties encountered.



EVENTS

Academy of Technology Annual Convention and Grand Prix

November 27th

Innovation in the Agri-Food Sector

More than three hundred players from research, industry, education and politics participated in the first convention of the Academy of Technologies held on 27 November at the Maison de la Chimie (Paris), in presence of Frédérique Vidal, Minister of Higher Education, Research and Innovation.

Three awards were presented to innovative start-ups and SMEs in the agri-food sector

Biopic: use of sensors to monitor the health of cows and improve milk production. Genialis: design and application of a machine combining cryogenisation and food gasification. Ynsect: industrialisation process of breeding and production of insect proteins for fish farming.



Academy of Technology Annual Convention and Grand Prix

Thematic Sessions

January 11 - Nuclear waste in France and around the world

February 8 - Organic farming

May 10 - Cybersecurity

June 14 - Maritime issues and potentialities?

July 5 - Big data: an ethical challenge?

September 13 - Massive ageing populations: costs and industrial opportunities

November 8 - Artificial learning or Machine Learning

December 6 - Winter sports and technologies

Breakfast - debates

January 11, 2017 - Patrick Pouyanné, Chairman and Chief Executive Officer of Total

February 8, 2017 - Daniel Harari, General Manager of Lectra

April 13, 2017 - Henning Kagermann, Co-Chairman of acatech

May 10, 2017 - Jacques Aschenbroich, Chairman and CEO of Valeo

June 15, 2017 - Florent Battistella, President of Couach

July 5, 2017 - Denis Kessler, President and CEO of Scor

November 10, 2017 - Olivier Peyrat, Director General of the Afnor

December 13, 2017 - Marc Bauer, Mayor of Val d'Isère

Annual seminar

France is well placed in R&D expenditure but less so in innovation: how to solve this French paradox? The Academy's annual seminar provided an opportunity to review the key factors for creating dynamics of innovation.

Conferences & Seminars

January 26 - (Re)constructing vocational training paths that are as close as possible to the needs of companies.

March 8 - 1937-2037: a century of technological emergence.

October 1-3 - Science and Technology in Society (STS) forum (Kyoto).

June 12 - The Scientific and Intelligence Community

October 7 - Robotics and mental health: which robots to assist the sick... and to avoid making the healthy sick?

November 7-8 - Euro-CASE annual conference on the subject of 'Cybersecurity' (Poland).

November 1-16 - CAETS annual conference devoted to bioeconomy (Madrid).

PARTNERSHIPS

FRANCE

As an organization for reflection on France's industrial policy, the Academy contributes to the governance of technological issues, in particular by involving its members in or for the benefit of think tanks and decision-making bodies. Let us quote in particular:

- France Stratégie, appointed by the Minister of Labour and the Secretary of State for Digital Affairs to analyse the transformations in work related to the development of AI.
- The French Parliamentary Office for Scientific and Technological Assessments.

The Academy's work can respond to requests from the State and lead to opinions, such as the ongoing study with the Academy of Sciences on the resources of the French subsoil in order to satisfy the needs of the energy transition. A report will be submitted to the Minister of Ecological and Solidarity Transition in April 2018.

INTERNATIONAL

DELEGATE FOR INTERNATIONAL AFFAIRS:

Bruno Revellin-Falcoz, Honorary President of the Academy of Technologies

Europe is a privileged sphere of influence for the Academy of Technologies: thanks to Euro-CASE, for which it provides the general secretariat, thanks to the European Commission, with which it maintains regular contacts and through its bilateral cooperations, particularly with Germany.



Euro-CASE

Association of Academies of Technology and Engineering in Europe

SECRETARY GENERAL: Yves Caristan

SAPEA

2017 is the year in which the Science Advice for Policy by European Academies project was launched. Officially launched in Brussels on 13 December 2016, SAPEA is part of the European Scientific Advisory Mechanism. The project is funded by the European Commission with a contribution of €6 million over four years. SAPEA is implemented by five European academic networks: Academia Europaea, the European Federation of Academies of Science and Humanities (ALLEA), the Scientific Advisory Council of European Academies (EASAC), Euro-CASE, the Federation of European Academies of Medicine (FEAM).

The overall objective of the project is to bring together the independent scientific expertise of more than 100 European academies from over 40 countries. Euro-CASE organised two exchange seminars between European academies and led the drafting of the quality assurance guide for SAPEA reports. Through its work platforms, Euro-CASE can bring out topics of study for SAPEA.

Cybersecurity, agriculture, ocean

Several reports have been prepared within the framework of the European mechanism for scientific advice, with the collaboration of the Academy of Technologies: Cybersecurity ; New Technologies in Agriculture, and Food supply from the Ocean. A new report on the capture and use of CO₂ is scheduled for April 2018. It is piloted by Euro-CASE.

Furthermore, cybersecurity was the theme of the Euro-CASE annual conference (Poland, 7-8 November).

PARTNERSHIPS

Working platforms

The Academy of Technologies contributes to the Euro-CASE platforms:

Energy: Future European cooperation on energy is in the exploration phase.

Innovation: work of this platform resulted in the publication of the report «Obstacles to innovation and development of innovative SMEs».

Engineering Education: two lines of work are explored: »to know the gaps in engineering education»; »Big Data and learning analysis in engineering education».

Bio-economy.

Frontiers of Engineering

60 engineers under the age of 45 gathered at the symposium organized by Euro-CASE and the American National Academy of Engineering (United States, 25-27 September). Discussions focused on cutting-edge developments in four areas: space exploration technologies, next-generation solar cells, neuroengineering, and digital imaging.

European Commission

The Academy maintains regular contacts with several European Commissioners. It received Carlos Moedas, Commissioner for Research, Technology and Innovation, to exchange views on the relationship between the new European Innovation Council (EIC) and the European Institute of Innovation and Technology (EIT).

Germany

Reflections with acatech continued, notably on the theme «Industry of the future/industry 4.0» with Henning Kagermann, chairman of the committee for the dialogue on innovation between the German government and the scientific and industrial community.

United Kingdom

The Academy of Technology continued its exchanges with the Royal Academy of Engineering on cybersecurity, health, technology education and African politics.

CAETS

The Council of Academies of Engineering and Technological Sciences brings together the engineering academies of 27 countries around the world. Its annual conference (Madrid, November 13-16) was devoted this year to the bioeconomy - in particular the blue bioeconomy.

GID - Southern Europe and the African continent Inter-Academic Grouping for Development

PRESIDENT: François Guinot, Honorary President of the Academy of Technologies

The Academy of Technologies participated in :

- the eighth Euro-Mediterranean Parmenides Forum organized by the GID in Genoa (Italy, 21-23 March 2017) on the theme: «What knowledge to reconcile the evolution of port facilities and sustainable development in the Mediterranean?».
- the Fastdev Agri forum for the improvement of youth employment in agricultural trades in Africa, Fastdev Agri, took place in Abidjan on 20 and 21 November 2017, on the occasion of the agriculture and animal resources fair in Côte d'Ivoire.



China

The National Academy of Technologies and the Academy of Science of France, together with the Chinese Academy of Engineering (CAE), have published a report on the future of nuclear power worldwide, particularly in emerging countries. The report was presented on 20 September at the 61st General Conference of the International Atomic Energy Agency (IAEA) in Vienna.



Chinese and French delegations meeting in Funging

India

A joint conference project with the Indian Academy of Technology on increasing levels of pollution from human activity in land and ocean systems is expected to take place by the end of 2018 in France and then in India in 2019.

Japan

STS Forum - Kyoto, 1-3 October

The 14th edition of the STS Forum (Science and Technology in Society Forum) was chaired by the Prime Minister of Japan, Shinzo Abe. This event brought together more than 1200 participants. The forty sessions and associated events: energy and environment, ICT and smart cities, innovation, health, resource conservation, education.

Mexico

Within the framework of the cooperation agreement with the Mexican Academy of Engineering (MAE), discussions focused on topics of common interest, including Big Data, Internet of Things and Cybersecurity.

ORGANISATION & GOVERNANCE

On January 10, 2018, the Academy of Technologies, meeting in plenary session, elected a new president to replace Alain Bravo who, after a year as president, has chosen to shorten his term of office to focus on the creation of the Maison des technologies pour le progrès et l'innovation with the Association nationale de la recherche et de la technologie (ANRT). Bruno Jarry, former vice-president, was elected president. Pascal Viginier, Inspector General for the Orange-France Telecom Group, was appointed Vice President.



Bruno Jarry

After a university career - as a researcher at the CNRS, then professor of genetics at Louis Pasteur University and director of the Strasbourg University School of Biotechnology - Bruno Jarry joined ORSAN, the biotechnology subsidiary of the Lafarge Group, in 1988 as vice-president of R & D.

From 1995 onwards, he was R & D Director of the Belgian Amylum Group, then, from 2000 onwards, Scientific Director of the British group Tate & Lyle, a global supplier of ingredients and solutions for the food industry. He was then adviser to the President of the Institut Curie (2004 - 2006) and finally Special Adviser in the Prime Minister's Office in charge of matters related to biofuels and green chemistry (2007 - 2013).

Bruno Jarry is a director of IFP Énergies nouvelles and several biotech companies.



Pascal Viginier

A former student of Ecole Polytechnique (X 76) and École nationale supérieure des télécommunications, Pascal Viginier is now Inspector General at Orange.

He joined the France Telecom - Orange Group in 1981, where he held various operational IT and sales positions. He was appointed Director of the Research and Development Division in 1998, then Sales Director for France in 2006. From September 2009 to March 2010, he led the preparation of Orange's merger with T-Mobile in the UK, which led to the creation of Everything Everywhere, the UK's leading mobile operator. He then served for seven years as head of the information systems department of the France Telecom-Orange Group.

Plenary Assembly

As a political and deliberative body, it adopts opinions and reports, approves the general guidelines and the programme of action. It is composed of 319 full and *éméritus* members.

Each year, the Academy recruits new members in order to broaden or deepen its scope of reflection and action, within the framework of a rigorous recruitment procedure, which takes into account the excellence of persons and the influence of their work in Europe and abroad. On 11 December 2017, the Plenary Assembly elected 12 new members, bringing the number of academics to 319.

Executive Board

It is an executive body composed of the president, vice-president, general delegate and outgoing president. The chairman of the works committee participates in this body.

Academic Council

The Academic Council is a consultative body for the decisions proposed for the vote of the Assembly. It is composed of 4 members of the Bureau, 5 *ex officio* members and 7 elected members.

Delegations

The delegations prepare and implement the decisions of the Academic Council.

- Communications
- Key Competencies and Training
- Publications
- International Relations
- Regional Relations
- 4 Territorial Delegations

Committees

Recruitment Committee

The committee proposes candidates to be elected. They are selected according to a rigorous procedure. The Assembly votes for their admission in a plenary session.

Work Committee

The committee draws up the work programme of the commissions and facilitates its implementation. It proposes presentations and debates for academic sessions.

Quality Committee

The committee guarantees the quality and impartiality of publications.

Commissions

Eleven commissions analyze major technological issues of our time in their working groups. Systemic analysis is preferred, as well as risk/opportunity analysis and social acceptability. Each report answers ethical questioning.

- Biotechnologies
- Education, training, employment and territories
- Energy and climate change
- Environment - Environment
- Ethics, society and technologies
- Mobility and transport
- Research, technology, innovation, employment
- Technologies and Health
- Technology and development in the least developed countries
- Information and communication technologies
- Urban planning and housing.

Cross-cutting strategic actions

They provide answers to questions of national interest, where technology plays a major role: engineering and major projects; innovation, growth and employment; new urban operators; soft power; and innovative technologies and territories.

Contacts for international affaires



International organisation

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