

A. The Concept of Science

I. Preliminaries

Analysing the governance of science – whether at the domestic or global level – requires a concept of the term “science”¹. What appears to be easy at first sight – everyone has at least a vague idea of what science is – proves considerably more difficult once factual and legal connotations of the term are considered in depth. The intrinsic factual particularities of the term set aside temporarily, both main obstacles to its definition in the field of international law are obvious.

Firstly, the notion of science is not used in any particular legal instrument of general recognition. We are well aware that in such universal documents even terminology may be subject to intensive debate, doubtful efforts of definition or continuous uncertainty – considering examples such as “peace” in Article 39 UN Charter² or “self-determination” in human rights treaties such as Article 1 ICCPR³ only. Of course, the notion of science is used in international legal texts (see below E. III.), but there is no single document or even group of documents the quest for a definition can concentrate upon. Consequently, the task of defining the term is part of the effort to design the subject matter itself. There is no positivist approach or else given idea to the concept of international law of science or, more generally, to its legal governance.

Secondly, the term “science” has, without any doubt, different meanings in the various jurisdictions of the world. This is due not only to the quite obvious linguistic divergences, be it between the different languages (science, Wissenschaft, science, scienza, scienza, наука, ... to name but a few of them) or even within one language (science, scholar-

¹ Cf. also Sebastian Steinecke, *Zur internationalen Governance der Wissenschaft*, 2010, manuscript pp. 78 *et seq.*

² Cf. only Jochen Abraham Frowein and Nico Krisch, in: Bruno Simma (ed.), *The Charter of the United Nations. A Commentary, Volume I*, 2nd ed., 2002, Article 39, para. 6.

³ Manfred Nowak, *U.N. Covenant on Civil and Political Rights. CCPR Commentary*, 2nd ed. 2005, Article 1, paras. 32 *et seq.*

ship and academia, Wissenschaft and Wissenschaften...). What is more, is that its importance in law differs from jurisdiction to jurisdiction from mere irrelevance where there are no legal rules governing the field of science to constitutional dignity where there is an explicit guarantee of freedom of science⁴. Discovering the legal framework of governance of science implies the need to find a notion which is at least acceptable to a majority of jurisdictions and also apt to digest the various approaches that may exist in the legal sphere. At any rate, the starting point is outside the law and lies in the historical depth of the term.

II. Science in Context

1. Thought, Philosophy, Method

The idea of science is deeply rooted in the history of the human quest for knowledge, driven by doubt and reflection, aimed at comprehensive understanding of the self and the world around it⁵. In the western world⁶, it is supposed to begin with the view of the Presocratics (e.g. *Anaximander*, *Anaximenes*, *Heraklit*, *Pythagoras*, *Thales*) on nature, methodologically steered by a strong sense of logics and an admiration, if not (continuing) mystification, of numbers and mathematical operations⁷. This found its worthy perpetuation in the abstractive idealism of *Socrates* and *Plato* and the dialectic method so essential for the intellectual reflection, altogether brought to perfection by *Aristotle*⁸. The reception of ancient Greek thinking was constitutive not only for Roman philosophy (above all in the works of *Cicero*), but also for scholastic

⁴ Cf. below C.

⁵ Comprehensively Sebastian Steinecke (supra note 1), manuscript pp. 71 *et seq.*

⁶ See above all Lucio Russo, *The Forgotten Revolution*, 2004. For even earlier forms of “science” see Henri Frankfort and Henriette Frankfort, “Myth and Reality”, in: id. (eds.), *Before Philosophy. The Intellectual Adventure of Ancient Man*, 1946, pp. 11-36.

⁷ André Pichot: *Die Geburt der Wissenschaft. Von den Babyloniern zu den frühen Griechen*, 1995, pp. 282 *et seqq.*

⁸ Cf. Paolo Crivelli, *Aristotle on Truth*, 2006; Jan Szaif, “Die Geschichte des Wahrheitsbegriffs in der klassischen Antike”, in: Markus Enders and id. (eds.), *Die Geschichte des philosophischen Begriffs der Wahrheit*, 2006, pp. 1-32.

thought in the Middle Ages (above all *Thomas Aquinas*)⁹. The ages of rationality and enlightenment reinforced the methodological rigidity of calling into question religious, traditional or else given truths, so that the works of *René Descartes* and *Immanuel Kant* can particularly be considered the methodological core of western thinking¹⁰.

It is in this epoch at the latest that the history of scientific thinking is interwoven with the history of universities as a particular institution for the promotion and proliferation of science¹¹. The achievements of the brothers *Humboldt* are crucial not only from a germanocentric perspective (which shall of course be avoided), but in the reforms triggered in particular by *Wilhelm von Humboldt* we can see a culmination of both the idea of the university up to his time (with places such as Bologna, Paris, Oxford and Cambridge as predecessors outside Germany to be mentioned by all means) and the world-wide success of that very idea in modern times: it is well known that newly founded universities in the United States of America (Johns Hopkins University, Baltimore 1876; University of Chicago, 1890; California Institute of Technology, 1891) took up the *Humboldtian* ideal and that traditional American institutions of higher education (such as Harvard and Princeton) shifted towards this ideal (and away from British and French examples) after the downfall of the Napoleonic empire¹².

⁹ Thomas Aquinas, *The Disputed Questions On Truth*, Vol. I, translated by Robert William Mulligan, 1952.

¹⁰ On Descartes cf. Ferdinand Alquié, *Wissenschaft und Metaphysik bei Descartes*, 2001; Hans Radermacher, *Cartesianische Wissenschaftstheorie*, 1971. For Kant cf. only Immanuel Kant, "The Contest of Faculties", in: Hans Siebert Reiss (ed.), *Kant: Political Writings*, 2nd ed. 1991, pp. 176-190.

¹¹ Cf. Helmut Schelsky, *Einsamkeit und Freiheit. Idee und Gestalt der deutschen Universität und ihrer Reformen*, 1963.

¹² Ronald Sandler, *Academic Freedom in the USA*, 1999, available at www.rbs2.com/afree.htm; Hermann Röhrs, *Der Einfluss der klassischen deutschen Universitätsidee auf die Higher Education in Amerika*, 1995, pp. 73-85; Roy Turner, "Humboldt in North America? Reflections on the Research University and its Historians", in: Christoph Schwinges, *Humboldt International. Der Export des deutschen Universitätsmodells im 19. und 20. Jahrhundert*, 2001, pp. 289-312 at pp. 289 *et seq.*; Walter Metzger, "The German Contribution To The American Theory Of Academic Freedom", *American Association of University Professors Bulletin* 41 (1955), pp. 214-230, printed in: id. (ed.), *The American Concept of Academic Freedom in Formation. A Collection of Essays and Reports*, 1977; Balakrishnan Rajagopal, "Academic Freedom as a Human

Given this universal reach of the *Humboldtian* idea of the university and of science, it is justified to take up some of its content in defining what science means as an object of governance and legal regulation. According to his famous dicta, solitariness and freedom lay the foundations of scientific thought – the independent, reflective and free activity of the single thinker¹³. Science – *Wissenschaft* – in this tradition is the never ending, serious and methodologically planned quest for truth, as the German Federal Constitutional Court (*Bundesverfassungsgericht*) defined with reference to *Humboldt* and the interpretation of his works by the early 20th century legal scholar *Rudolf Smend*¹⁴. Again, we submit that these ideas are not intrinsic to German philosophic and legal thought but are designed to convey a universal concept of what is encompassed in science¹⁵.

Along the same lines as *Humboldt*, *Robert Merton* in his work on the sociology of science, undertakes to define science by means of four elements (often known as “CUDOS” for the first letters of the respective terms): (1) communalism – all scientifically gained knowledge has to be accessible for free debate and scientists renounce intellectual property rights in exchange for reputation, (2) universalism – the quality of science to stand intersubjective control, (3) disinterestedness – the absence of any pecuniary or otherwise material interest and finally (4) organised scepticism – all scientific results have to be able to be called into question at all times¹⁶. *Merton’s* concept has been criticised to be

Right. An Internationalist Perspective”, in: *Academe* Vol. 89, issue 3 (May-June 2003), pp. 25-28 at p. 26.

¹³ Cf. Helmut Schelsky (supra note 11).

¹⁴ *Entscheidungen des Bundesverfassungsgerichts* 35, 79 at p. 113, recurring upon Wilhelm von Humboldt, *Über die innere und äußere Organisation der höheren wissenschaftlichen Anstalten in Berlin* (1809/10), quoted in: Ernst Anrich (ed.), *Die Idee der deutschen Universität*, 1956, pp. 375-386 at p. 379: science as “... etwas noch nicht ganz Gefundenes und nie ganz Aufzufindendes” – *something not yet found and never really to be found*, in the interpretation by Rudolf Smend, “Das Recht der freien Meinungsäußerung”, *Veröffentlichungen der Vereinigung der Deutschen Staatsrechtslehrer* 4 (1928), pp. 44-74, at p. 67.

¹⁵ The requirement of “methodological plannedness” does not exclude random results (which took place in the history of science, e.g. in the discovery of penicillin and X-ray, cf. Sebastian Steinecke (supra note 1), manuscript pp. 82 and 84.

¹⁶ Robert K. Merton, “Science and Technology in a Democratic Order”, *Journal of Legal and Political Sociology* 1 (1942), pp. 115-126.

too idealist¹⁷, but this should not exclude it from our perspective since it has gained large influence and is at least partly subject to general consent. Also, the current approach of the American Physical Society is *Humboldtian* in its methodological perspective, as it defines:

“Science is the systematic enterprise of gathering knowledge about the universe and organizing and condensing that knowledge into testable laws and theories.”¹⁸

Of course there is further development of methodology and content of scientific thought after *Humboldt*. It may be fair to say that such categories as the theory of science or sociology of science did not come into being before very recently¹⁹. But instead of going into the seminal works of authors like *Gottlob Frege*, *Alfred Tarski*, *Charles Sanders Pierce*, *Jürgen Habermas* or *Wilhelm Kamlah*²⁰, an important point for legal analysis has to be made: While it is true without any doubt that science is about serious human reflection on certain problems, it does not include all such reflection. To take up a *bon mot* often used, which criticises the *Humboldtian* approach: A police officer investigating into a crime tries to acquire knowledge by methodologically sound and serious reflection – but he is certainly not a scientist²¹. Beyond such obvious exclusions, other reflective activity has to be set aside, such as political debate or literary thought, which may also be subject to governance and legal regulation, but in other fields of the law, with different purposes and distinct legal limits. Intellectual reflection, philosophical thought, intellectual exchange of ideas may take place in scientific con-

¹⁷ Cf. S. Barry Barnes and R.G.A. Dolby, “The Scientific Ethos: A Deviant Viewpoint”, *Archives Européennes de Sociologie* XI (1970), pp. 3-25; Harriet Zuckerman, “Sociology of Science”, in: Neil Joseph Smelser (ed.), *Handbook of Sociology*, 1988, pp. 511-574 at pp. 517 *et seq.* A reason for the strong ethical orientation of Merton’s approach is its direction against the oppression of academic freedom in totalitarian regimes (Peter Weingart, *Wissenschaftssoziologie*, 2003, at pp. 15 *et seq.*, in particular at p. 19).

¹⁸ American Physical Society, *Statements on Ethics and Values*, Nr. 99.6 “What is Science?” (1999).

¹⁹ Cf. only Alan Francis Chalmers, *Science and its Fabrication*, 1990; id., *What is this thing Called Sciences*, 3rd ed. 1999.

²⁰ Cf. Sebastian Steinecke (supra note 1), manuscript pp. 154 *et seq.*

²¹ Hans Joachim Schneider, *Kriminologie für das 21. Jahrhundert – Schwerpunkt und Fortschritte der internationalen Kriminologie*, 2001, p. 115; Christian Starck, in: Hermann von Mangoldt/Friedrich Klein/id. (eds.), *Kommentar zum Grundgesetz*, Vol. 1, Article 5, para. 352.

texts, but this is not necessarily so. Nonetheless, what can be stated as a result of this *tour d'horizon* through western intellectual history is that science as a potential object for legal governance is about the methodologically sound creation of knowledge with a general purpose.

2. Technology

Most institutions, principles and rules to be analysed in this book can be related to such an idealistic notion of science only with great difficulties. Undoubtedly, scientific research in modern times is to a vast extent linked to the creation of technological development – and to its economic benefits, be it of researchers, commercial applicants or users of scientifically gained products. Applied technological science does not quest for truth, but is designing reality²². It is as much part of the self-image of the scientific world as of the perception of society at large that visible effects of research in technological and finally economic terms are part of the matter. Any concept of the law of science excluding such applied research would be imperfect, if not outside social reality²³. Efforts in research have largely shifted from universities or public entities (such as the noble *Academies* of former times²⁴) towards private business²⁵, whether as such or in particular forms of public-private-partner-

²² Matthias Ruffert, “Grund und Grenzen der Wissenschaftsfreiheit”, *Veröffentlichungen der Vereinigung der Deutschen Staatsrechtslehrer* 65 (2006), pp. 146-210 at p. 157 (recurring upon Ralf Kleindiek, *Wissenschaft und Freiheit in der Risikogesellschaft*, 1998, pp. 128 *et seq.*; following Hans-Peter Dürr, *Das Netz des Physikers*, 1988, pp. 10 *et seq.*). Cf. also Karin Knorr-Cetina, *The Manufacture of Science*, 1981.

²³ Nonetheless, such concepts are proposed by David Lindberg, *Die Anfänge des abendländischen Wissens*, 2000, pp. 1 and 6, and Klaus Pähler, *Qualitätsmerkmale wissenschaftlicher Theorien*, 1986, p. 2.

²⁴ Cf. Marta Ornstein, *The Role of Scientific Societies in the Seventeenth Century*, 1975.

²⁵ The bulk of expenses in research efforts is spent here: Helmuth Schulze-Fielitz, “Politische Voraussetzungen wissenschaftlicher Forschung”, in: Horst Dreier and Dietmar Willoweit (eds.), *Wissenschaft und Politik*, 2010, pp. 71-106 at p. 77 *et seq.*

ships²⁶. It can be shown that a considerable part of international legal regulation in science is mainly applicable to such result-driven research on an economic background. To give but one prominent example: One of the few comprehensive texts on the international governance of science, the (not legally binding) “Frascati Manual” of the OECD defines researchers as²⁷

“... professionals engaged in the conception or creation of new knowledge, products, processes, methods, and systems, and in the management of the projects concerned.”

The proximity of such notion of the researcher to science in a technological and economic context is obvious, considering both the institution issuing that definition and the content of the definition. It should finally be added that there is no reason at all to “downgrade” such research in legal or even in moral terms, given that the entanglement of scientific and economic activity can be proven even historically²⁸.

3. Scholarship?

At this point at the latest, the linguistic trap has to be efficiently avoided. Readers from the Anglo-Saxon world could easily criticise the approach of this book towards science for lack of precision, looking with less criticism to what has been said on science, technology and economy, but with more harsh reproaches against the inclusion of fields such as philosophy, history – or jurisprudence. It has already been mentioned that there are gaps and even trenches between “science” (in English but also in French) on the one hand and notions such as “Wissenschaft” and “наука” on the other hand, the former being confined to research activity related to nature and technology, the latter referring also to what would be called “scholarship” within the “humanities” in Eng-

²⁶ Cf. Ulrich Hilpert, “The State, Science and Techno-Industrial Innovation. A New Model of State Policy and a Changing Role of the State”, in: id. (ed.), *State Policies and Techno-Industrial Revolution*, 1991, pp. 3-40 at pp. 10 *et seq.*

²⁷ OECD, *The Measurement of Scientific and Technological Activities, Proposed Standard Practice for Surveys of Research and Experimental Development, Frascati Manual*, 1993, p. 86.

²⁸ See already Friedrich Schiller (together with Johann Wolfgang von Goethe), “Xenien aus dem Musen-Almanach für das Jahr 1797”, in: Friedrich Schiller, *Gedichte* (edited by Georg Kurscheidt), 1992, pp. 577-629, at p. 585.

lish²⁹. But if we were to further elaborate on this distinction, it proves flawed already in linguistic terms: a professor of philosophy or law would perhaps not be considered a “researcher” in the English speaking world, but certainly a “chercheur” in France (though there is no “science de la philosophie” or “du droit” in French). After all, the international governance of the field of research has to be open to different jurisdictions and their linguistic approaches. This book will therefore not be unaware of terminological divergences and diversities, but it will also not take them as the basis of exclusive operations. On the contrary: The effects produced by different understandings of “science” will be shown in parts of the book.

III. Scientific Revolutions and the Scientific Community

Science is not only an individual activity, but a social phenomenon³⁰. The recognition of an activity as scientific research by the community of researchers, the scientific community, is crucial for the description of what is science. This aspect proves helpful to exclude many activities of the quality of everyday reflection (the above-mentioned police investigation) and also of “pseudo-science”. For ages, wise men have tried to produce gold, to predict individual and collective faith from the position of celestial bodies or to heal diseases by applying magnetic forces. Neither alchemy nor astrology nor mesmerism are considered to be sciences, though, for the very reason that they lack recognition by the scientific community for obvious reasons³¹. A similar approach may be

²⁹ On this tradition cf. Wissenschaftsrat, *Empfehlungen zur deutschen Wissenschaftspolitik im Europäischen Forschungsraum*, 2010 (Drucksache 9866-10), at p. 20.

³⁰ Cf. Helga Nowotny, “The Changing Nature of Public Science”, in: id./Dominique Pestre/Eberhard Schmidt-Aßmann/Helmuth Schulze-Fielitz/Hans-Heinrich Trute, *The Public Nature of Science under Assault*, 2005, pp. 1-27. Cf. also Rudolf Stichweh, “The Multiple Publics of Science: Inclusion and Popularization”, *Soziale Systeme* 9 (2003), pp. 210-220; on the popularization of science.

³¹ Cf. on astrology Bart Bok and Lawrence Jerome (eds.), *Objections to Astrology*, 1975; Paul Thagard, “Why astrology is Pseudoscience”, *Proceedings of the Biennial Meeting of the Philosophy of Science Association* 1 (1978), p. 223-234. This does not exclude that these “sciences” produced results that could be used in the recognised natural sciences, cf. William Newman, *Atoms and Al-*

taken towards intellectual constructions taking some inherent “truths” for granted either for religious reasons (e.g. creationism) or due to fixed ideological orientations (e.g. certain Marxist tendencies or those who deny the existence of the Shoah).

But implying the perspective of the international communities is not devoid of risk. What if the contemporary scientific communities of *Nikolaus Kopernikus* and *Galileo Galilei* had been asked to assess the research activity of their colleagues? What if *Isaac Newton* and his contemporaries had had the opportunity to subdue *Albert Einstein’s* theories under a similar assessment? In his seminal work on scientific revolutions, *Thomas Kuhn* shows that research may be undertaken in two ways: (1) “standard science” following a certain scientific paradigm and (2) research leading to a change of paradigm, thus to a scientific revolution³². Breaking new ground and overturning hitherto recognised buildings of knowledge is an integral part of the most important research activities and their results. Thus, recognition and acceptance within the scientific community must not be given overall and absolute importance, but may themselves be called into question³³.

For the purpose of international legal governance, it is rarely necessary to draw a distinct line between science and “pseudo-science”, though. In most instances, the reference to the perspective of the scientific community will be a reliable indicator. If, however, this perspective leads to the exclusion of a person or activity from the field of science, and if this implies legal consequences, the perception of the scientific community cannot be taken for granted without closer scrutiny.

IV. Science and the Law

Whatever the role of the scientific community, science has its own rules. Not only is it impossible to predict where the quest for new knowledge leads the scientist and the general public, but it is also impossible to regulate the scientific process as such. The law can create space for free scientific research, it can erect institutions that promote scientific activ-

chemy. Chemistry and the Experimental Origins of Scientific Revolution, 2006, and Alison Winter, *Mesmerized. Powers of Mind in Victorian Britain*, 1998.

³² Thomas Kuhn, *The Structure of Scientific Revolutions*, 3rd ed. 1996, p. 23.

³³ Cf. Roy Wallis (ed.), *On the Margins of Science: The Social Construction of Received Knowledge*, 1979.

ity and it can set the legal framework to provide material resources for science – but it cannot order scientific progress to take place³⁴. Moreover, legal restrictions may interfere with the free creation of the results of scientific research. In a way, the autonomy of the scientific world is vested with a degree of hostility towards legal regulation³⁵. In States with a democratic constitution and in an international legal sphere which considers the democratic creation of law as a value as such, this juxtaposition between law and science can be described as a provoking tension between science and democracy³⁶.

V. A Tentative Definition

All in all, this book analyses the international legal governance of science which is considered as the reflected, autonomous quest for new knowledge that can be integrated into existing systems of knowledge or bears the capacity to overcome them, notwithstanding the technological or economic applicability of such knowledge³⁷.

³⁴ For a recent assessment cf. Helmuth Schulze-Fielitz, “Politische Voraussetzungen wissenschaftlicher Forschung”, in: Horst Dreier and Dietmar Willoweit (eds.), *Wissenschaft und Politik*, 2010, pp. 71–106.

³⁵ Matthias Ruffert (supra note 22), p. 160 *et seq.*

³⁶ Matthias Ruffert (supra note 22), at p. 161. This is in a certain contradiction with the assumption that a more democratic a society, the more there is free science. This assumption is propounded by international institutions such as the Council of Europe (CM/AS(2007)Rec1762 final of 1 October 2007: “The Committee of Ministers believes that academic freedom and university autonomy are among the indicators which measure how democratic a society is.”) as well as by academic writers (Robert Merton, “The Normative Structure of Science”, in: Norman Storer (ed.), *The Sociology of Science: Theoretical and Empirical Investigations*, 1973, pp. 267–280 at p. 269; David Hollinger, “The Defense of Democracy and Robert K. Merton’s Formulation of the Scientific Ethos”, *Knowledge and Society: Studies in the Sociology of Culture Past and Present* 4 (1983), pp. 1–15, as well as Ronald Tobey, *The American Ideology of National Science 1919–1930*, 1971, Chapter 2 *et seq.*; André Pichot (supra note 7), pp. 547 *et seq.*, who tries to prove the assertion mentioning the fact that science first blossomed in democratic ancient Greece). Also democratically created legislation is able to restrict science if it voluntarily (or even accidentally) interferes with its inherent autonomy.

³⁷ Sebastian Steinecke (supra note 1), manuscript p. 182.

B. Global Administrative Law

I. An Emerging Concept for the Legal Analysis of the Governance of Science

The idea of developing administrative legal structures at a global level is a prominent conceptual invention in current public law thinking. The theoretical approach to global administrative law aims at the elaboration of interrelationships between administrative entities on a world scale, the identification and analysis of decision-making processes and law-creating mechanisms in the divergent systems of legal sources, be they international or domestic, and their scrutiny according to the different tasks which can be ascribed to an administrative system¹. At the heart of the concept is the legally sound accomplishment of different policy tasks at global level by mechanisms that can be construed more or less analogously to those mechanisms that are pertinent in domestic administrative (legal) systems². *Sabino Cassese*, one of the most influential proponents of the idea of global administrative law, goes so far even as to draw a parallel between the current debate and the emergence of administrative law as a domestic legal concept by authors such as *Edouard de Laferrière* and *Otto Mayer*³. At the same time, the related

¹ Nico Krisch, "The Pluralism of Global Administrative Law", *European Journal of International Law* 17 (2006), pp. 247 *et seq.*; Benedict Kingsbury/Nico Krisch/Richard B. Stewart, "The Emergence of Global Administrative Law", *Law and Contemporary Problems* 68 (2005), pp. 15 *et seq.* at p. 17. See also Daniel C. Esty, "Good Governance at the Supranational Scale: Globalizing Administrative Law", *Yale Law Journal* 115 (2006), pp. 1490-1562.

² Sabino Cassese, "Administrative Law without the State? The Challenge of Global Regulation", *New York University Journal of International Law and Politics* 37 (2005), pp. 663-694. at pp. 668 *et seq.*

³ Sabino Cassese, "Is There a Global Administrative Law?", in: Armin von Bogdandy/Rüdiger Wolfrum/Jochen von Bernstorff/Philipp Dann/Matthias Goldmann (eds.), *The Exercise of Public Authority by International Institutions*, 2010, pp. 761-776.

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