

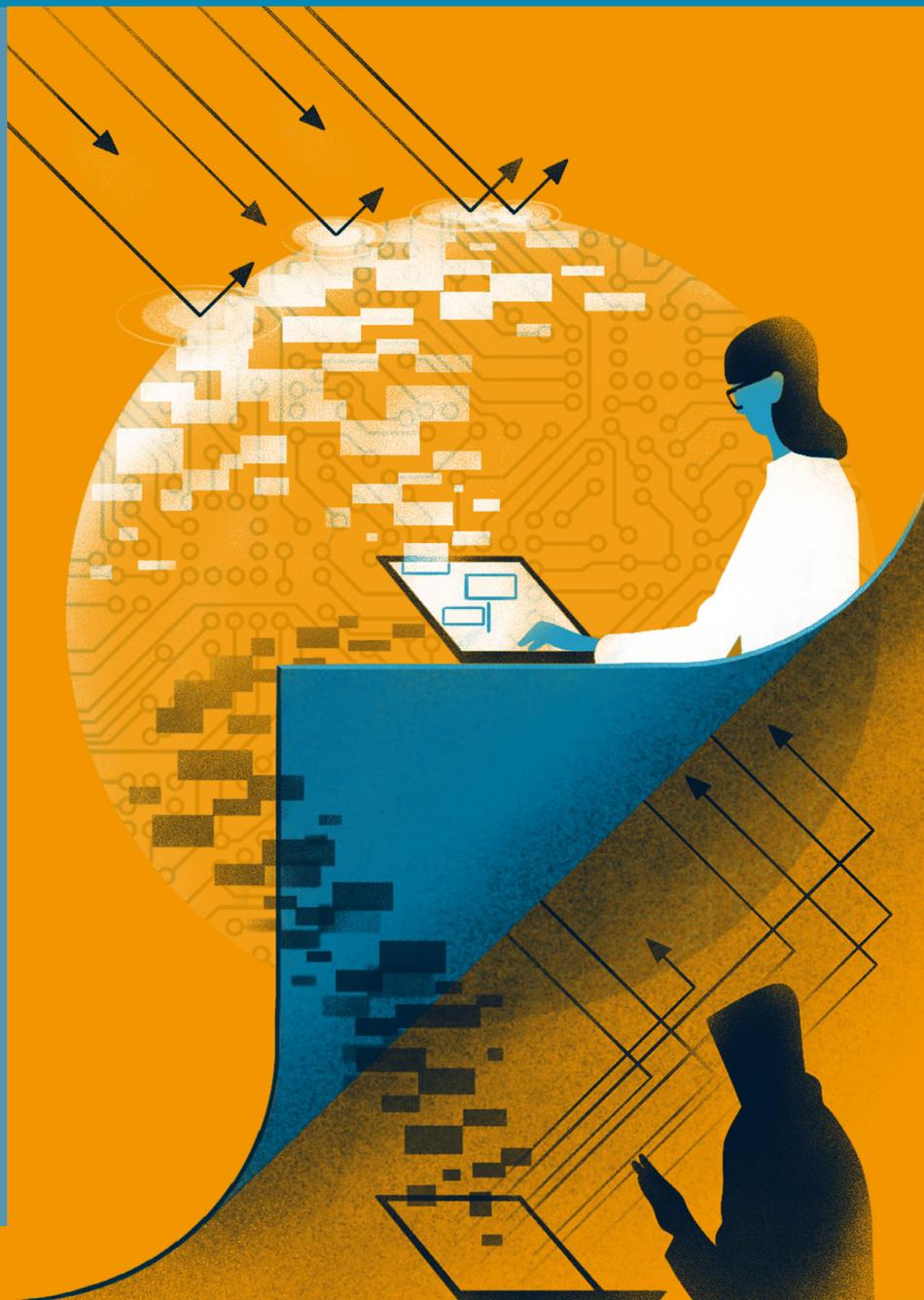


GEMEINSAMER AUSSCHUSS  
ZUM UMGANG MIT  
SICHERHEITSRELEVANTER  
FORSCHUNG

# Joint Committee of DFG and Leopoldina on the Handling of Security-Relevant Research

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# Preface

The German National Academy of Sciences Leopoldina and the Deutsche Forschungsgemeinschaft (German Research Foundation, DFG) continue their efforts to increase awareness around the problem of the possible misuse of both findings and research techniques and to strengthen the assessment competence for this issue, and to limit any corresponding risks. The common goal is to handle the freedom of research, which ultimately serves useful, peaceful purposes and thus the good of society, with the necessary responsibility. It is therefore all the more important for researchers and research institutions to be sensitised to the security-relevant legal and ethical aspects of their work and advised on how to deal with possible risks. As early as 2014, the DFG and the Leopoldina published general guidelines to this end called “Scientific Freedom and Scientific Responsibility – Recommendations for Handling Security-Relevant Research” for all scientific disciplines and updated them in 2022. Self-governance in the sciences was placed centre-stage here, as it enables research risks to be handled in an appropriate way and allows for a flexible response. The *Joint Committee on the Handling of Security-Relevant Research* of the DFG and the Leopoldina supports and accompanies the implementation of the recommendations with the aim of further developing and strengthening the sciences’ autonomous handling of research risks and making this approach transparent.

Russia’s war of aggression in Ukraine and the consequences of the sanctions imposed as a result have exposed the risks that can emanate from certain regimes and dependencies on them. Nevertheless, ongoing dialogue and cooperation with such states can be essential, including to counter the spread of misinformation, promote exchange on shared values and jointly address global challenges such as climate change and marine pollution. This also applies to international academic cooperation, which is increasingly being discussed and reviewed with regard to certain countries and the evident global armament. Not least the war in Ukraine has shown that the integrity of nations and democratic basic orders are not unassailable even in the 21st century and sometimes even must be defended by military means. This puts the strictly civilian orientation of research at many universities and non-university research institutions in Germany to the test. After all, even research whose results can or even are intended to be used directly for military purposes, for example in the field of cyber security, pattern recognition or the economic impact of sanctions, can ultimately serve to maintain or restore peace and democracy. Corresponding risk-benefit considerations place particularly high demands on the personal responsibility of researchers within the scope of the scientific freedom granted by the constitution.

More than 120 German research institutions and organisations have now established committees and commissioners in accordance with the recommendations of Leopoldina and DFG that are responsible for the ethical evaluation of security-relevant research and advise researchers as required. Even though most of them are now firmly established in the statutes, they still need to sustainably consolidate the experience they have gained, strengthen their visibility and acceptance among researchers, and more actively participate in awareness-raising measures as outlined above. The corresponding resources for this must be made available on a long-term basis.

October 2022



**PROFESSOR GERALD HAUG**

President of the German National  
Academy of Sciences Leopoldina



**PROFESSOR KATJA BECKER**

President of the German  
Research Foundation

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# Summary

Security-relevant research and associated risks are constantly evolving, for example through new synergies between different disciplines such as artificial intelligence, biometrics, engineering and molecular biology. The Joint Committee on the Handling of Security-Relevant Research, an advisory body set up by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) and the German National Academy of Sciences Leopoldina, monitors these developments on an ongoing basis, identifies need for action and advises the boards of the DFG and the Leopoldina on these issues. The Joint Committee also fosters a responsible approach to research freedom through public events and close collaboration with the Committees for Ethics in Security-Relevant Research (KEFs – German acronym).

Aspects of security-relevant research and related ethical questions are increasingly shifting into the focus of national and international discourse, not least due to global armament and academic links with states in which human rights violations and other violations of rule-of-law principles are observed time and again. The aim is to uphold one's own values and principles on the one hand, and to facilitate international cooperation on the other, for example when it comes to global challenges such as climate change, world food supply and species extinction. Some risks of the misuse of security-relevant research can be controlled by the tried-and-tested procedures of export control, though this is limited by what can be legally defined and regulated, especially in the case of so-called emerging technologies.

Chapter A of the Joint Committee's fourth progress report lays out the background and developments leading up to the establishment of the Joint Committee in 2015. The initiative arose partly from the international debate on the opportunities and risks of experiments with viruses leading them to gain new functions (gain-of-function experiments), such as easier transmission between humans. Security-relevant research of concern is scientific research work that has the potential to produce knowledge, products or technologies that could be directly misused by third parties to cause significant damage to human dignity, life, health, autonomy, property, the environment or peaceful coexistence. Against this background, Chapter A presents the joint "Recommendations for Handling Security-Relevant Research" and provides information on the status of German and international discourse in selected fields of security-relevant research, for example on certain work in synthetic biology, artificial intelligence or robotics. It also addresses the corresponding legal foundations of the Federal States and universities, and the parameters for funding security-relevant research. The need for a responsible and regulated handling of security-relevant research risks is anchored in the DFG Proposals Preparation Instructions and in the DFG Guidelines for Safeguarding Good Research Practice. Codes of conduct relevant to the sciences, export control requirements and guidelines for cooperation are also explained.

Chapter B focuses on the tasks and the objectives of the Joint Committee. The committee's mandate includes, for example, strengthening researchers' awareness of the ethical aspects of security-relevant research and further developing and fostering a responsible approach to security-relevant research and the required self-governance within the research community. More than 150 German research institutions,

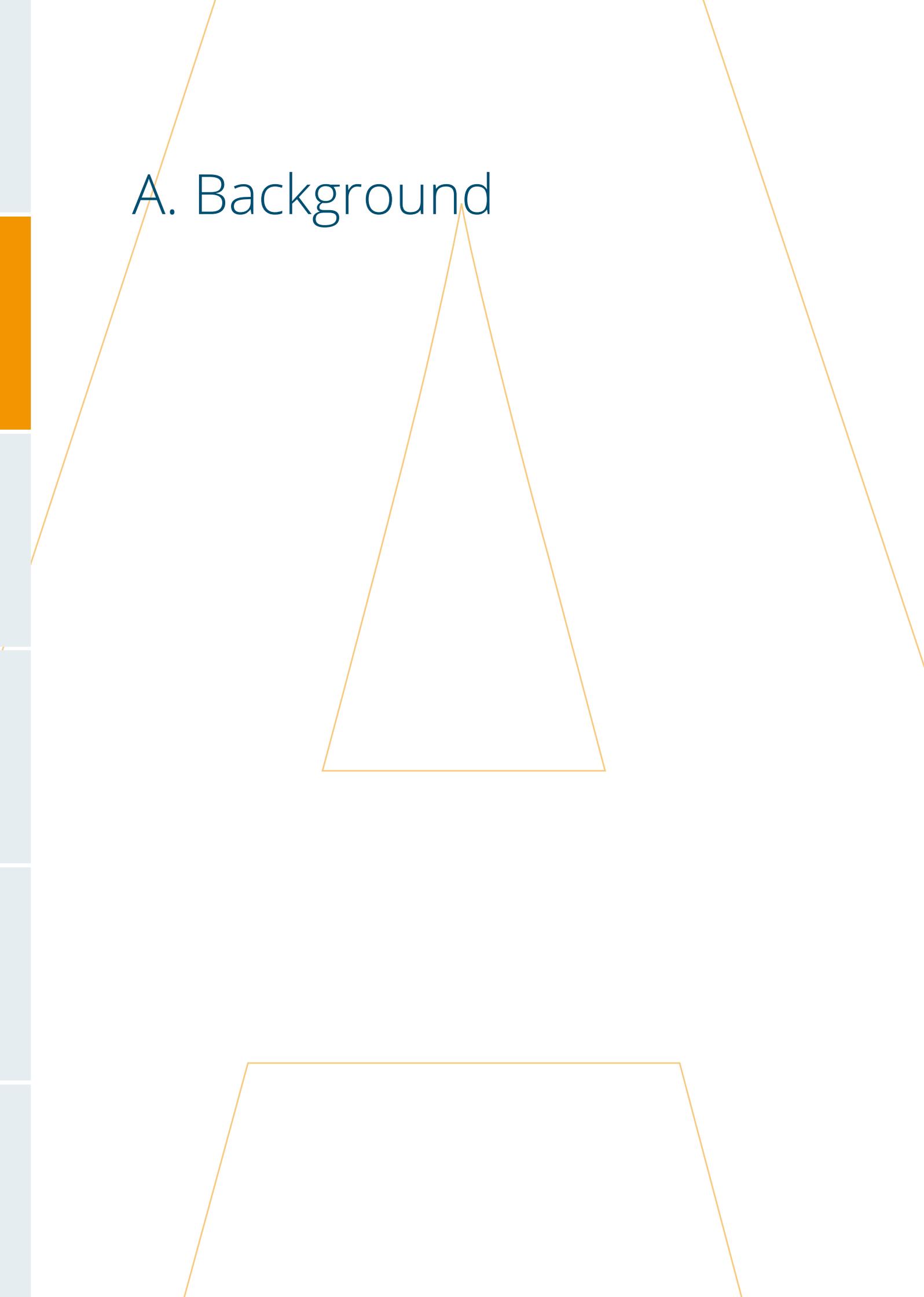
organisations, science associations and one industry association have now appointed contact persons for handling security-relevant research. Throughout Germany, more than 100 KEFs or corresponding representatives are available to advise researchers. The chapter also provides insight into the work and competencies of the KEFs based on the results of the surveys by the Joint Committee, and presents key questions arising from these for the ethical assessment of security-relevant research. These are central questions that (1) suggest the need for a KEF to advise researchers, (2) may be important for the KEFs' processing of the request, and (3) may be important for the KEFs' final assessment and consultation. Between 2016 and 2021, the KEFs deliberated on at least 94 potentially security-relevant cases. Only in seven of these cases were there negative advisory votes, but there were also numerous recommendations on specific conditions for the projects. The surveys revealed that security-relevant work of concern continues to be a rare exception in academic research, but that the KEFs also deal with other, partially overlapping security-relevant issues. These include the compatibility of research with basic constitutional principles and guiding principles of research institutions, issues relating to research funding, data protection, export control, and risks in connection with military-related sponsors and cooperation partners. However, the surveys and research conducted by the Joint Committee also show that the work of the contact persons and the KEFs is frequently still not institutionally anchored as an ongoing process. In many cases, mechanisms need to be put into place to reinforce the visibility and acceptance of procedures for the handling of security-relevant research and to prevent the expertise gained in the handling of security-relevant research from being lost.

Chapter C describes the participation of members and the office of the Joint Committee in public debates and further activities related to the handling of security-relevant research, as well as documenting the events that the Joint Committee has organised over the last two years. For example, the online event "Dual Use in chemistry research" took place in May 2021. The discussion around chemical syntheses, nanotechnology and nuclear chemistry focused on the opportunities, risks and responsibilities of these research areas, as well as the question of how to raise awareness of ethical aspects of research among students and researchers. Similar questions were the topic of the discussion evening "Science for questionable purposes – dual use and its consequences". At the event "Biometrics and Personal Rights" in October 2021, opportunities as well as real-life applications of biometrics research were presented and there was a discussion on how to limit the misuse of corresponding identification tools, for example for mass surveillance. At the third "KEF Forum" at DESY, a large-scale research facility, in Hamburg in April 2022, members of the KEFs discussed cases of security-relevant research that had occurred and shared their experiences regarding the respective ethical assessment, evaluation and consultation.

Chapter D sets out the future tasks and objectives of the Joint Committee based on its work and experience so far. The focus of its work continues to be:

- supporting and strengthening German research institutes in adopting a responsible approach to security-relevant aspects of research through regular surveys, KEF forums, specialist events and information material,
- monitoring procedures and new developments in security-relevant research and concisely communicating the current state of knowledge to science, policymakers and the public right up to the international level,
- and supporting competence-building for the work of KEFs with lectures and multi-media information materials as well as assistance in anchoring security-relevant aspects of research in education and teaching.

# A. Background



## 1. Scientific freedom and scientific responsibility

Freedom of research as protected by the German constitution grants researchers the right to raise their own scientific questions and address these questions independently within the conditions laid out by the legal regulations. Freedom of research is fundamental to expanding human knowledge and ensuring social progress and prosperity. However, useful research findings and research methods can also be misused for harmful purposes. One example of this “dual-use dilemma” in research is the discovery of nuclear fission in the 1930s, which also led to the development and use of nuclear weapons of mass destruction. As a result, there has been an intense debate on the responsibility of the sciences,<sup>1</sup> which regularly focuses not only on the expected benefits but also on the potential risks of security-relevant research projects. In 2012, research groups in the Netherlands and Japan/USA published five genetic changes that are necessary for highly pathogenic influenza viruses of the type H5N1 (known as avian flu viruses) to become airborne between mammals.<sup>2</sup> These research projects caused great concern worldwide about the usefulness and risks of such security-relevant research.

**BOX 1.** Based on the common understanding of “dual-use research of concern”, the Joint Committee of the DFG and the Leopoldina (Chap. B 1) uses the term *security-relevant research of concern* to summarise projects that can potentially pose significant risks for the security of human dignity, life, health, freedom, property, the environment or peaceful coexistence. Security-relevant risks arise, in particular, in research which produces knowledge, products or technologies that could be misused directly by third parties.

The two research groups mentioned above defended the importance of their work on the transmission of flu viruses, arguing that their findings made it possible to understand how the virus could develop into a potential threat for humans through spontaneous, naturally occurring mutations. This knowledge would make it much easier to classify the pandemic potential of the virus variants that are constantly emerging in nature and to take more targeted protective measures. The COVID-19 pandemic, which has been spreading rapidly around the world since late 2019, showed the importance of early research on highly pathogenic pathogens and how essential it can be to share research results in the area of security-relevant research of concern with as few barriers as possible.

1 See, e.g., Russell-Einstein Manifesto (1955). Available at: <https://unesdoc.unesco.org/ark:/48223/pf0000017290>; Göttinger Manifesto (1957). Available at: [www.uni-goettingen.de/en/54320.html](http://www.uni-goettingen.de/en/54320.html) (both last accessed: 27 September 2022).

2 See also Herfst S. et al. (2012). Airborne transmission of influenza A/H5N1 virus between ferrets. *Science* 336.6088: 1534–1541; Imai M. et al. (2012). Experimental adaptation of an influenza H5 HA confers respiratory droplet transmission to a reassortant H5 HA/H1N1 virus in ferrets. *Nature* 486.7403: 420–428.

## A. Background

Critics of this type of research fear that the pathogens produced for research purposes could escape from the high-security laboratories into the environment through negligent conduct. These risks are reflected in numerous regulations whose aim is to ensure biological safety (biosafety) (see also Chap. A 2).<sup>3</sup> Another potential hazard is that the publication of such research findings makes knowledge available that may be misused for bioterrorism attacks or biological warfare. A number of regulations are in place, including regular criminal law, the United Nations' Biological Weapons Convention and the regulations of the German Federal Office of Economics and Export Control (BAFA, see Chap. A 4.1), which are intended to prevent the spread and use of biological, chemical and nuclear weapons. Alongside preventive measures on the part of security agencies<sup>4</sup> and the work of law enforcement authorities, self-governance by the scientific community is also of great importance here (see Chap. A 3).

However, security-relevant research risks exist not only in nuclear and pathogen research, but also, albeit to varying degrees, in almost all disciplines. Results from materials research and nanotechnology could contribute to the development of offensive weapons; research findings on automated industrial and domestic robots could be used for the construction of intelligent combat robots; analyses of molecular plant genetics for breeding purposes could enable targeted attacks on seeds; research in information technology, for example on movement analysis and biometrics, could be used for the comprehensive surveillance and repression of individuals and thus restrict human rights. To improve cybersecurity, researchers often intentionally develop compromising hardware and software and break encryption procedures. Psychological, medical and neurobiological research could assist in the manipulation of individuals up to and including aggressive interrogation methods and torture. Linguistic research on speech recognition systems can under certain circumstances be employed for the abusive surveillance of communications. Ultimately, even the humanities and the cultural, social and behavioural sciences could produce security-relevant results. The list is nearly endless (for detailed case studies of security-relevant work see Appendix 1).

However, failure to carry out certain research can also be problematic from an ethical point of view if, for example, this hinders the development of treatments, vaccines and other protective measures and prevents important innovations for the common good, e.g. environment and climate protection.

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3 In particular, in Germany this refers to the Biological Agents Ordinance (Biostoffverordnung), the Genetic Engineering Act (Gentechnikgesetz) and the Protection Against Infection Act (Infektionsschutzgesetz).

4 See explanations by the Federal Office of Civil Protection and Disaster Assistance, Division III.2 on CBRN protection. Available (in German) at: [www.bbk.bund.de/DE/AufgabenundAusstattung/CBRNschutz/Biologie/biologie\\_node.html](http://www.bbk.bund.de/DE/AufgabenundAusstattung/CBRNschutz/Biologie/biologie_node.html) (last accessed: 27 September 2022).

## 2. Debate on security-relevant research in the German Bundestag

Following the influenza virus debate at the beginning of the second decade of the 21st century, the German Ethics Council recommended, in addition to measures to raise awareness of biosafety issues in the scientific community, to strengthen the legal regulation of dual-use research of concern (DURC) via a central DURC Commission in Germany.<sup>5</sup> A corresponding motion by the parliamentary group BÜNDNIS 90/DIE GRÜNEN was rejected by the German Bundestag, but it was nevertheless announced that the largely autonomous approach to handling research risks recommended by the DFG and the Leopoldina (see Chap. B) would be monitored and re-evaluated in due course.<sup>6</sup>

In the course of the search for the origin of SARS-CoV-2, the discussion arose that the new virus could have originated from a laboratory, given that research was being conducted at China's Wuhan Institute of Virology regarding the transmissibility of animal pathogenic coronaviruses to humans. Although the hypothesis of a laboratory origin is considered rather unlikely by scientists, it has not yet been conclusively disproved. SARS-CoV-2 is closely related to the SARS pathogen (SARS-CoV),<sup>7</sup> which first appeared in China in 2002. Over the last two decades, other viruses closely related to SARS-CoV and SARS-CoV-2 have been found in various bat species. It is therefore considered very likely that SARS-CoV-2 has evolved from a naturally occurring coronavirus in bats and has adapted to humans as a new host through spontaneously occurring mutations in its genome.<sup>8</sup>

Due to the above-mentioned laboratory hypothesis, the discussion about gain-of-function experiments on viruses – i.e. work in which the pathogens acquire new properties, for example in order to check whether a transition from animals to humans could occur under certain circumstances or in order to develop specific preventive protective measures – has arisen again in German politics.<sup>9</sup> However, the discussion in this context tends to focus on issues of laboratory safety rather than the misuse of research. In response to a question from the AfD parliamentary group on whether there was a need to expand biosecurity regulations in Germany, the Federal Government replied in April 2022 that, in its opinion, local regulations such as the Biological

5 The corresponding statement "Biosecurity – Freedom and Responsibility of Research" (2014) is available at: [www.ethikrat.org/fileadmin/Publikationen/Stellungnahmen/englisch/opinion-biosecurity.pdf](http://www.ethikrat.org/fileadmin/Publikationen/Stellungnahmen/englisch/opinion-biosecurity.pdf) (last accessed: 27 September 2022).

6 On the extensive political debate in Germany see the Progress Report of the Joint Committee 2018, Chapter A 2. Available at: [www.sicherheitsrelevante-forschung.org/en/publication-progressreport2018/](http://www.sicherheitsrelevante-forschung.org/en/publication-progressreport2018/) (last accessed: 27 September 2022).

7 Gorbalenya, A.E., Baker, S.C., Baric, R.S., de Groot, R.J., Drosten, C., Gulyaeva, A.A., ... & Ziebuhr, J. (2020). The species *Severe acute respiratory syndrome-related coronavirus*: classifying 2019-nCoV and naming it SARS-CoV-2. *Nat Microbiol* 5, 536-544.

8 Holmes, E. C., Goldstein, S. A., Rasmussen, A. L., Robertson, D. L., Crits-Christoph, A., Wertheim, J. O., & Rambaut, A. (2021). The origins of SARS-CoV-2: a critical review. *Cell* 184(19), 4848-4856; Zhou, H., Ji, J., Chen, X., Bi, Y., Li, J., Wang, Q., ... & Shi, W. (2021). Identification of novel bat coronaviruses sheds light on the evolutionary origins of SARS-CoV-2 and related viruses. *Cell* 184(17), 4380-4391.

9 See expert opinion of the Scientific Services of the German Bundestag of 23 August 2021, "Gain-of-function Research and Dual-Use Research of Concern". Available (in German) at: [www.bundestag.de/resource/blob/867492/6b63ac17cdf8ff5fb8aa7d2d8c78fe7f/WD-8-077-21-pdf-data.pdf](http://www.bundestag.de/resource/blob/867492/6b63ac17cdf8ff5fb8aa7d2d8c78fe7f/WD-8-077-21-pdf-data.pdf) (last accessed: 27 September 2022).

Agents Ordinance, the Genetic Engineering Act and the Genetic Engineering Safety Ordinance were sufficient and that no additional governmental notification procedure for gain-of-function experiments was considered necessary.<sup>10</sup> It also referred to the role of the Joint Committee and the KEFs in the independent risk-benefit assessment of such work by the sciences.

The Federal Government has also had the areas of artificial intelligence, autonomous systems and machine learning examined in various committees in recent years and sees a need for action with regard to sensitising researchers to ethical issues and minimising risks.<sup>11</sup> In October 2020, the Federal Government's Select Committee on Artificial Intelligence presented its final report on the subject, in which it called for the results of AI research to be evaluated with regard to the risks of misuse and for a directive on the ethical use of AI to be agreed with the EU.<sup>12</sup> In November 2020, the Bundestag Committee on Education, Research and Technology Assessment held an expert discussion on Autonomous Weapon Systems (AWS), with particular emphasis on the progressed development of lethal drones that operate in swarms.<sup>13</sup> Previously, the Office of Technology Assessment at the German Bundestag had published a report on the topic.<sup>14</sup> The report outlines various deployment scenarios of AWS and broadly discusses the advantages and disadvantages of warfare with these systems and who bears the legal and ethical responsibility. According to the report, however, the systems are not yet fully developed, so that there should be no regulatory intervention in the relevant research and development.<sup>15</sup>

### 3. Recommendations of DFG and Leopoldina for handling security-relevant research

In the opinion of the DFG and the Leopoldina, legal provisions offer only a very limited means of controlling the opportunities and risks associated with free research. Research methods and content are constantly changing and research findings, as well as their future application, tend to be rarely possible to predict. The DFG and the Leopoldina ceaselessly work to ensure that ethical principles and mechanisms for the responsible handling of freedom of research and research risks are observed and further developed by the scientific community.

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- 10 See the Federal Government's response to the question by Thomas Seitz, Corinna Miazga and the AfD parliamentary group - Printed Paper 20/1147 -Gain-of-Function Research. Available (in German) at: <https://dserver.bundestag.de/btd/20/011/2001147.pdf> (last accessed: 27 September 2022).
  - 11 Data Ethics Commission of the Federal Government (2019). Opinion of the Data Ethics Commission. Available at: [www.bmi.bund.de/SharedDocs/downloads/EN/themen/it-digital-policy/datenethikkommission-abschlussgutachten-lang.pdf?\\_\\_blob=publicationFile&v=4](http://www.bmi.bund.de/SharedDocs/downloads/EN/themen/it-digital-policy/datenethikkommission-abschlussgutachten-lang.pdf?__blob=publicationFile&v=4) (last accessed: 27 September 2022).
  - 12 German Bundestag Printed Paper 19/23700. Available (in German) at: <https://dserver.bundestag.de/btd/19/237/1923700.pdf> (last accessed: 27 September 2022).
  - 13 See [www.tab-beim-bundestag.de/english/events\\_2020-expert-discussion-autonomous-weapon-systems.php](http://www.tab-beim-bundestag.de/english/events_2020-expert-discussion-autonomous-weapon-systems.php) (last accessed: 27 September 2022).
  - 14 Available (in German) at: <https://publikationen.bibliothek.kit.edu/1000127160> (last accessed: 27 September 2022).
  - 15 See (in German) <https://dserver.bundestag.de/btd/19/236/1923672.pdf> (last accessed: 27 September 2022).

A working group of the DFG and the Leopoldina developed a set of general guidelines on handling security-relevant scientific research based on the Max Planck Society's "Guidelines and Rules on a Responsible Approach to Freedom of Research and Research Risks".<sup>16</sup> These general guidelines were published in 2014 under the title "Scientific Freedom and Scientific Responsibility – Recommendations for Handling Security-Relevant Research"<sup>17</sup> and updated by the Joint Committee in 2022.<sup>18</sup> The guidelines place great importance on instruments of self-governance within the scientific community given the familiarity of researchers with their subject and that it allows for a flexible response. In the first part of the recommendations, the DFG and the Leopoldina urge researchers not to content themselves with complying with legal regulations. Due to their basic right to freedom of research, their knowledge and their experience, researchers have a particular ethical responsibility that goes beyond their legal obligations. Every scientist must, therefore, be fundamentally aware of the danger of research misuse. In critical cases, these individuals need to make a personal decision about what is responsible with regard to their research. In doing so, they need to weigh the opportunities offered by the research against the risks for human dignity, life and other important values. The recommendations specify these considerations in terms of necessary risk analysis, measures for reducing risk and evaluating the publication of research results. The primary goal is to carry out research and communicate its results in a responsible manner. In isolated cases, a responsible decision on the part of the researcher may also mean that a research project is temporarily suspended or indeed not carried out at all.

The second section of the recommendations is aimed at research institutions which set the framework for ethically responsible research. Research institutions need to raise awareness of the problem, convey the required knowledge of legal constraints placed on research and support corresponding training measures for scientists. They need to develop ethics rules for handling security-relevant research that go beyond compliance with legal regulations. Each institution should set up a special Committee for Ethics in Security-Relevant Research (KEF – German acronym) to implement these rules and to advise its scientists.

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16 Available at: [www.mpg.de/197392/researchFreedomRisks.pdf](http://www.mpg.de/197392/researchFreedomRisks.pdf) (last accessed: 27 September 2022).

17 Available at: [www.sicherheitsrelevante-forschung.org/en/publication-scientificfreedom2014](http://www.sicherheitsrelevante-forschung.org/en/publication-scientificfreedom2014) (last accessed: 1 November 2022).

18 Available at: [www.sicherheitsrelevante-forschung.org/en/publication-scientificfreedom2022/](http://www.sicherheitsrelevante-forschung.org/en/publication-scientificfreedom2022/) (last accessed: 21 November 2022).

### 4. Legal framework and funding of security-relevant research

#### 4.1 Export control and international research cooperation

As introduced in Chap. A 1, the misuse of research is prevented by a number of legal provisions, primarily by regular criminal law, international treaties such as the Biological Weapons Convention and the Chemical Weapons Convention and, in Germany, the export regulations of the Federal Office of Economics and Export Control (BAFA). The BAFA implements the authorisation requirements and procedures stipulated by the EU for all member states for the export of goods (e.g. chemicals, machines, technologies, materials and software) that have both civilian and military applications. This Dual-Use Regulation<sup>19</sup> applies to the export of goods (e.g. laboratory equipment, test equipment, as well as tangible technology in emails or on data carriers or clouds) but also to the intangible transfer of knowledge (“technical assistance”). In the academic sector, export control also applies to visiting scientists.

The global armament in the wake of Russia’s war of aggression in Ukraine is making export control and the associated licensing requirements for international collaborations and publications in academic science increasingly important. In response to Russia’s attacks, cooperation between German and Russian state research institutions has largely been put on hold,<sup>20</sup> while personal contacts with Russian scientists continue to exist. Due to embargo measures, Russia has long been subject to trade restrictions on dual-use items, which in principle also entail stricter approval requirements for the transfer of tangible and intangible goods in scientific cooperation.

In order to provide researchers better access with respect to their mandatory export control obligations, BAFA, in cooperation with the Helmholtz-Zentrum Berlin für Materialien und Energie GmbH, the Fraunhofer-Gesellschaft, the Leibniz Institute DSMZ, the Robert Koch Institute and the TU Berlin, published the manual “Export Control and Academia” in 2019,<sup>21</sup> which is primarily aimed at export control officers at the respective research institutions. In addition, BAFA, the Federal Ministry for Economic Affairs and the Federal Foreign Office will be addressing the specific requirements locally as part of their road show.

In late 2021, the European Commission published corresponding recommendations on internal compliance programmes for the control of research in accordance with the Dual-Use Regulation.<sup>22</sup> The recommendations are an EU-wide, legally non-binding guide for the science and research sector.

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19 Regulation (EU) 2021/821 of the European Parliament and of the Council on setting up a Union regime for the control of exports, brokering, technical assistance, transit and transfer of dual-use items is available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32021R0821> (last accessed: 27 September 2022).

20 See (in German) [www.wissenschaftsrat.de/SharedDocs/Pressemitteilungen/DE/PM\\_2022/PM\\_Allianz\\_Ukraine.html](http://www.wissenschaftsrat.de/SharedDocs/Pressemitteilungen/DE/PM_2022/PM_Allianz_Ukraine.html) (last accessed: 27 September 2022).

21 Available and further information on export control of science at: [www.bafa.de/SharedDocs/Downloads/EN/Foreign\\_Trade/ec\\_awareness\\_academia.html](http://www.bafa.de/SharedDocs/Downloads/EN/Foreign_Trade/ec_awareness_academia.html) (last accessed: 27 September 2022).

22 Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32021H1700> (last accessed: 27 September 2022).

When weighing up the conflicting priorities of a need for global cooperation, complex global trade chains and the protection of human rights, scientific cooperation with Chinese state research institutions has also come under increasing scrutiny in recent years. On the one hand, China is signalling increased interest in international research cooperation, e.g. in European large-scale facilities, and is increasingly investing in basic research infrastructures.<sup>23</sup> On the other hand, concerns are rising about patent and copyright infringement, one-sided technology transfer, scientific misconduct, and lack of access to important research infrastructures and data. In addition, there are increasing reports of the rise of political influence on the Chinese science sector and a growing fusion of military and civilian research, for example in areas such as artificial intelligence, robotics, semiconductors, cryptography, unmanned vehicles and radar technology.<sup>24</sup> In this regard, the Dutch Hague Center for Strategic Studies already developed a checklist for cooperation with Chinese research institutions in 2019, which should guide political and scientific decisions when minimising risks.<sup>25</sup>

In this complex interplay of interests, the Federal Ministry of Education and Research (BMBF) and other research organisations in Germany are also developing guidelines or strategies for scientific cooperation with China, which are intended to provide assistance and raise awareness of possible risks, for instance by strengthening independent China expertise<sup>26</sup> and legal advice<sup>27</sup>. In the case of cooperation projects with a connection to China, the Fraunhofer-Gesellschaft carries out a business policy review process following a foreign trade law review process, before the contract is drawn up. Furthermore, the BMBF, in cooperation with the German Rectors' Conference, held a series of exchange talks on China cooperation with representatives from politics and science between 2021 and 2022, with a perspective towards working out how cooperation can continue to be facilitated in the future while maintaining ethical principles

23 See also [www.desy.de/news/news\\_search/index\\_eng.html?openDirectAnchor=2149&two\\_columns=0](http://www.desy.de/news/news_search/index_eng.html?openDirectAnchor=2149&two_columns=0) (last accessed: 27 September 2022).

24 See also reports by the Australian Strategic Policy Institute (ASPI) "Picking Flowers, Making Honey: The Chinese Military's Collaboration with Foreign Universities" (2018) at: [https://ad-aspi.s3.ap-southeast-2.amazonaws.com/2018-10/Picking%20flowers%2C%20making%20honey\\_0.pdf?VersionId=H5sGNawXqMgTG\\_2F2yZTQwDw6OyNfH.u](https://ad-aspi.s3.ap-southeast-2.amazonaws.com/2018-10/Picking%20flowers%2C%20making%20honey_0.pdf?VersionId=H5sGNawXqMgTG_2F2yZTQwDw6OyNfH.u) and "The China Defence Universities Tracker" (2019) at: [https://ad-aspi.s3.ap-southeast-2.amazonaws.com/2019-11/The%20China%20Defence%20Universities%20Tracker\\_0.pdf?VersionId=ozli2cWm.kXpe7XsEZ44vJMMQBNfnR\\_x](https://ad-aspi.s3.ap-southeast-2.amazonaws.com/2019-11/The%20China%20Defence%20Universities%20Tracker_0.pdf?VersionId=ozli2cWm.kXpe7XsEZ44vJMMQBNfnR_x) and (in German) "China Science Investigation – Chinas Militärinteresse an Forschungskoooperation" at: [www.deutschlandfunk.de/china-science-investigation-hintergrund-recherche-100.html](http://www.deutschlandfunk.de/china-science-investigation-hintergrund-recherche-100.html) (each last accessed: 27 September 2022).

25 The checklist is available at: <https://hcss.nl/report/checklist-for-collaboration-with-chinese-universities-and-other-research-institutions/> (last accessed: 27 September 2022).

26 See also, in German, the WIKOOP-INFRA project (Ensuring safe, transparent and mutually beneficial collaboration with China at analytical research infrastructures) at: [www.desy.de/news/news\\_search/index\\_eng.html?openDirectAnchor=2149&two\\_columns=0](http://www.desy.de/news/news_search/index_eng.html?openDirectAnchor=2149&two_columns=0); "Leitfragen zur Hochschulkooperation mit der Volksrepublik China der Hochschulrektorenkonferenz" (2020) at: [www.hrk.de/positionen/beschluss/detail/leitfragen-zur-hochschulkooperation-mit-der-volksrepublik-china/](http://www.hrk.de/positionen/beschluss/detail/leitfragen-zur-hochschulkooperation-mit-der-volksrepublik-china/) and "Guidelines for the development of international collaborations of the Max-Planck-Gesellschaft" (2021) at: [www.mpg.de/16784189/mpg-guidelines-for-international-cooperations-2021.pdf](http://www.mpg.de/16784189/mpg-guidelines-for-international-cooperations-2021.pdf) (last accessed in each case: 27 September 2022).

27 For example, DLR, as the BMBF's project agency, offers initial legal advice on structuring cooperation with Chinese partners in the non-economic sector for the administrations of German state universities and the administrations of the institutions of the Fraunhofer-Gesellschaft, Helmholtz Association, Leibniz Association and Max Planck Society at [Erstberatung-Chinakoooperation@dlr.de](mailto:Erstberatung-Chinakoooperation@dlr.de), telephone: +49 30 67055 8276.

and ensuring positive effects for Germany and Europe. The Competence Centre for International Academic Collaboration (KIWi) of the German Academic Exchange Service (DAAD) also supports German universities in initiating, implementing and intensifying their international activities with advice and networked expertise.<sup>28</sup> To this end, the DAAD published a perspective paper in July 2022, which focuses on the changed framework conditions for international academic exchange in a multipolar world, particularly in light of Russia's war of aggression against Ukraine. These framework conditions should be met with "science diplomacy", an approach that focuses on discourse, understanding and the development of intercultural competence that goes beyond the actual object of cooperation.<sup>29</sup>

### 4.2 Higher education legislation and civil clauses

In Germany, the states of Bremen, Hessen, Lower Saxony, Thuringia and Schleswig-Holstein have already included a requirement for responsibly handling of security-relevant research in their higher education legislation. Bremen and Lower Saxony additionally require public debate on the issue. Lower Saxony and Schleswig-Holstein further require Senate Commissions for Research Ethics to be established.<sup>30</sup> Universities regularly hold internal discussions on whether specific security-relevant research projects or fields violate the sometimes very differently worded regulations and legally controversial self-governance obligations to carry out research for exclusively civilian applications (so-called civil clauses).<sup>31</sup> The focus is often on the military association of (foreign) employees or cooperation partners and their possibly targeted siphoning off of research results and methods for military purposes. In part, this also affects issues of foreign trade legislation and export restrictions (see also Chap. A 4.1). Civil clauses usually exclude misuse scenarios in political (e.g. threatened human rights violations), criminal or terrorist contexts, and cooperation with military-related actors as well as the military use of research results cannot automatically be equated with misuse, for example when it comes to defending state sovereignty and preserving the basic demo-

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28 See (in German) [www.daad.de/de/infos-services-fuer-hochschulen/kompetenzzentrum/](http://www.daad.de/de/infos-services-fuer-hochschulen/kompetenzzentrum/) (last accessed: 27 September 2022).

29 See (in German) [https://static.daad.de/media/daad\\_de/pdfs\\_nicht\\_barrierefrei/der-daad/220705\\_daad\\_awp-papier\\_perspektiven.pdf](https://static.daad.de/media/daad_de/pdfs_nicht_barrierefrei/der-daad/220705_daad_awp-papier_perspektiven.pdf) (last accessed: 27 September 2022).

30 A detailed presentation of the references made to the handling of security-relevant research in German state-level higher education legislation with corresponding references and quotations is available in Chap. B 4 of the Progress Report of the Joint Committee of 2018. Available at: [www.sicherheitsrelevante-forschung.org/en/publication-progressreport2018](http://www.sicherheitsrelevante-forschung.org/en/publication-progressreport2018) (last accessed: 01 November 2022).

31 Legal experts repeatedly point out the difficulty of reconciling academic freedom with a civil clause. See on this: Hufen, F. (2017). Wissenschaft zwischen Freiheit und Kontrolle. Zivilklauseln, Ethikkommissionen und Drittmittelkontrolle aus verfassungsrechtlicher Sicht: NVwZ 17, p. 1265–1268; Lassahn, P. (2014). Ziviler Gehorsam und Forschungsfreiheit. Zur rechtlichen Zuverlässigkeit von „Zivilklauseln“. JZ 69, p. 650–658. In view of the changed security situation brought about by the war in Ukraine, acatech, Germany's National Academy of Science and Engineering, is also calling for the removal of the civil clauses at universities and universities for applied sciences so that they are also permitted to conduct research for military purposes and thereby contribute to Germany's sovereignty. See Impulse Paper "Security, Resilience and Sustainability" (2022). Available at: <https://en.acatech.de/publication/security-resilience-and-sustainability/download-pdf?lang=en> (last accessed: 27 September 2022).

cratic order. This is why some universities in Germany have introduced corresponding advisory services through Committees for Ethics in Security-relevant Research (Chap. B. 2) as a solution to the “civil clause dilemma”.

### 4.3 Research funding

The DFG refers to the “Recommendations for Handling Security-Relevant Research”<sup>32</sup> on its website under the section “Principles of DFG Funding” and in its “Proposal Preparation Instructions”.<sup>33</sup> The DFG asks applicants to check their projects for security-relevant aspects before submitting their funding proposal. If a direct risk is identified in that the project could produce knowledge, products or technologies that could be misused to deliberately cause significant damage, the applicants are asked to submit a statement on the risk-benefit ratio and possible measures to minimise these risks. If, due to internal university regulations, a KEF or a comparable body must be involved in advance, a statement by the KEF should be attached to the proposal. Projects with a security risk are also discussed in detail by the scientific panels of the DFG, such as DFG’s Joint Committee (Hauptausschuss). The revised, binding “Guidelines for Safeguarding Good Research Practice” of the DFG also refer to the legal and ethical aspects of research: “Researchers adopt a responsible approach to the constitutionally guaranteed freedom of research. They comply with rights and obligations, particularly those arising from legal requirements and contracts with third parties, and where necessary seek approvals and ethics statements and present these when required. With regard to research projects, the potential consequences of the research should be evaluated in detail and the ethical aspects should be assessed.”<sup>34</sup> The accompanying explanations on the DFG Guideline 10 expressly state that research institutions of higher and non-higher education are responsible for ensuring that their members’ and employees’ actions comply with legal requirements and promote this through suitable organisational structures.

The EU Framework Programme for Research and Innovation “Horizon Europe” already requires funding proposals to include an ethics self-assessment of the potential risks of misuse of the research project that could pose a threat to human beings, animals and the environment. Accordingly, the associated guidelines also recommend that advisory committees be established for relevant ethical issues.<sup>35</sup> Furthermore, until the EU regulation on trustworthy AI is adopted (Chap. A 4.4), research projects involving ar-

32 See [www.dfg.de/en/research\\_funding/principles\\_dfg\\_funding/security\\_relevant\\_research/index.html](http://www.dfg.de/en/research_funding/principles_dfg_funding/security_relevant_research/index.html) (last accessed: 27 September 2022).

33 Available at: [www.dfg.de/formulare/54\\_01/54\\_01\\_en.pdf](http://www.dfg.de/formulare/54_01/54_01_en.pdf) (last accessed: 27 September 2022).

34 DFG (2019). Guidelines for Safeguarding Good Research Practice. Code of Conduct. Available at: [www.dfg.de/download/pdf/foerderung/rechtliche\\_rahmenbedingungen/gute\\_wissenschaftliche\\_praxis/kodex\\_gwp\\_en.pdf](http://www.dfg.de/download/pdf/foerderung/rechtliche_rahmenbedingungen/gute_wissenschaftliche_praxis/kodex_gwp_en.pdf) (last accessed: 27 September 2022).

35 See page 42 in Directorate-General for Research & Innovation of the European Commission “EU Grants – How to complete your ethics self-assessment” (Version 2.0 of 13 July 2021). Available at: [https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/common/guidance/how-to-complete-your-ethics-self-assessment\\_en.pdf](https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/common/guidance/how-to-complete-your-ethics-self-assessment_en.pdf) (last accessed: 27 September 2022).

tificial intelligence should follow the European “Ethics Guidelines for Trustworthy AI”,<sup>36</sup> which are intended to minimise unintended harm through prior security measures.

### 4.4 New regulations for research and development of artificial intelligence

Complex systems of automated algorithmic decision-making, often subsumed under the term “artificial intelligence” (AI), have long since arrived in everyday life, such as in online searches with search engines, credit checks, application processes, assistance systems or in personalised online advertising. Such systems enable semi-automated evaluation and decision-making processes based on large amounts of data, which were considered impossible until a few years ago and which are rarely comprehensible to users in terms of their underlying principles and decision-making rules.

In view of the various risks associated with using such technologies, their regulation has been moving into the spotlight for some years now. For example, in April 2021, the European Commission presented a “Proposal for a Regulation of the European Parliament and of the Council laying down harmonised rules on artificial intelligence (Artificial Intelligence Act) and amending certain Union legislative acts”.<sup>37</sup> Regulation aims to make the EU internal market a global leader in the development of safe, trustworthy and innovative AI systems through binding rules. AI systems developed and used in the EU should also be transparent, ethical, impartial and under human control. The draft outlines a tier system that divides AI applications into four risk categories based on their effects on health, safety and fundamental rights, with certain requirements for each.<sup>38</sup> AI applications that manipulate people to their detriment or conduct warrantless surveillance are to be banned under the draft.<sup>39</sup> The same applies to facial recognition software and the “social scoring” of citizens by government agencies, as practised in China, for example.

The proposals met with criticism from businesses and industry associations, while some civil society organisations are calling for even stricter rules.<sup>40</sup> The research network CLAIRE (Confederation of Laboratories for Artificial Intelligence Research in Europe), for example, warned that the definition of AI was too vague, that the draft lacked clear responsibilities with regard to the proposed regulatory mechanisms, and that there was no balance between the costs and benefits of regulation for businesses.

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36 See [https://ec.europa.eu/newsroom/dae/document.cfm?doc\\_id=60419](https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=60419) (last accessed: 27 September 2022).

37 See <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52021PC0206&from=EN> (last accessed: 27 September 2022).

38 See [https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/excellence-trust-artificial-intelligence\\_en](https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/excellence-trust-artificial-intelligence_en) (last accessed: 27 September 2022).

39 See (in German) A. Müller (2022). Der Artificial Intelligence Act der EU: Ein risikobasierter Ansatz zur Regulierung von Künstlicher Intelligenz – mit Auswirkungen auf die Schweiz, Zeitschrift für Europarecht. Available at: <https://eizpublishing.ch/artikel/euz/01-2022/artificial-intelligence-act-eu/> (last accessed: 27 September 2022).

40 See for instance <https://allai.nl/eus-ai-regulation-europe-puts-fundamental-rights-and-values-front-and-center/> (last accessed: 27 September 2022).

This would create legal uncertainties and jeopardise the competitive capabilities of AI research and development.<sup>41</sup> The extent to which academic research will actually be affected by the regulations is still unclear. Research for “legitimate purposes” would be exempt from the requirements, at least according to the draft, but the question arises as to the design of corresponding review processes. According to proposed amendments from late 2021, member states may want to exclude AI systems developed solely for military or scientific purposes from the scope of the regulation altogether.<sup>42</sup>

## 5. International developments and debates on security-relevant research

### 5.1 Life sciences

As outlined in Chap. A 1, security-relevant research in the life sciences is regularly the subject of international debate. The focus here continues to be on experiments in which pathogens acquire new properties (gain-of-function, Chap. A 2), advances in synthetic biology and the development of genetic engineering methods that enable “genome editing”, in particular gene drives that could be used for the genetic adaptation of wild animal populations.<sup>43</sup> It was for instance possible to synthetically produce the complete genome of the SARS-CoV-2 coronavirus,<sup>44</sup> and researchers were able to produce infectious horsepox viruses using a synthetically produced horsepox genome which they introduced into cells (see also case study 1 in the Appendix).<sup>45</sup> Such experiments raise the question of whether they provide a new basis for the creation of pathogens suitable for bioweapons, for example, if human pathogenic smallpox viruses, which have been eradicated since 1980, were to be “brought back to life”. The groups of researchers, however, argue that these experiments provided the basis for the study of new naturally occurring virus variants and the development of targeted protective measures such as specific vaccines or antiviral substances. The synergy effects that arise in the interaction of biological research with AI, robotics, additive manufactur-

41 See <https://claire-ai.org/wp-content/uploads/2021/08/CLAIRE-EC-AI-Regulation-Feedback.pdf> (last accessed: 27 September 2022).

42 See also (in German) [www.basecamp.digital/kuenstliche-intelligenz-wie-steht-es-um-den-ai-act-der-eu/](http://www.basecamp.digital/kuenstliche-intelligenz-wie-steht-es-um-den-ai-act-der-eu/) (last accessed: 27 September 2022).

43 See e.g. Academies Science Advisor Council (EASAC) (2015). Gain of function: experimental applications relating to potentially pandemic pathogens (2015); National Science Advisory Board for Biosecurity (NSABB) (2016). Recommendations for the Evaluation and Oversight of Proposed Gain-of-Function Research; National Academies of Sciences, Engineering and Medicine (2016). Annas, G. J., Beisel, C. L., Clement, K., Crisanti, A., Francis, S., Galardini, M., ... & Joung, J. K. (2021). A code of ethics for gene drive research. *The CRISPR Journal*, 4(1), 19-24. National Academies of Sciences, Engineering, and Medicine. (2017). Dual use research of concern in the life sciences: current issues and controversies. National Academies Press; Permanent Senate Commission on Key Questions of Genetic Research of the German Research Foundation (2018). *Synthetic Biology - Status Assessment and National Academies of Sciences Engineering and Medicines* (2018). *Biodefense in the Age of Synthetic Biology*.

44 Thao et al. (2020). Rapid reconstruction of SARS-CoV-2 using a synthetic genomics platform. *Nature* 582: 561–565.

45 See Noyce, R. S., Lederman S. and Evans, D. H. (2018). Construction of an infectious horsepox virus vaccine from chemically synthesized DNA fragments. *PLoS One*, 13(1):e0188453.

ing and other “enabling technologies” also harbour new, potentially security-relevant risks (see also Chap. A 5.2).<sup>46</sup>

The field of neurosciences is also becoming a subject of discussion against the background of various misuse scenarios as advances are made in conjunction with AI and engineering. For example, advanced brain-computer interfaces of the future, developed to assist physically impaired people, could be used to control unmanned weapons systems, and to illicitly measure and even influence emotions or read sensitive information such as geodata and passwords (see also case study 4 in the Appendix).<sup>47</sup>

The World Health Organization (WHO) recently issued a “Global guidance framework for the responsible use of the life sciences”.<sup>48</sup> Against the background of new technologies such as genome editing and convergences of the life sciences with other disciplines, strategies and checklists are proposed for minimising risks while exploiting potential benefits. In addition to the necessary standards for laboratory safety, the focus is also on raising awareness of the possibilities for misuse and various other instruments of governmental and non-governmental control.

### 5.2 IT research and robotics

Advances in IT research, especially in the field of machine learning, are increasingly being discussed in the context of risks of misuse, and not only in Germany (Chap. A 2). For instance, experts have been predicting for years that modern warfare and crime will increasingly rely on highly developed IT-based systems such as unmanned remote-controlled or autonomous machines, IT systems for identifying individuals by means of biometric profiles and movement patterns, quantum technology for encrypting and decrypting information, self-learning algorithms and so on. There are also fears that the internet will increasingly be used for military or extortion-motivated cyberattacks, e.g. on private and public infrastructures such as public electricity supply and communication as well as financial infrastructure, in order to bring public life to a standstill.<sup>49</sup>

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46 O'Brien et al. (2019). Assessing the Risks Posed by the Convergence of Artificial Intelligence and Biotechnology. *Health Security* 18: 219–227. Arnold, C. (2022). Cloud labs: where robots do the research. *Nature*, 606(7914), 612–613.

47 See Steinert, S., & Friedrich, O. (2020). Wired emotions: Ethical issues of affective brain-computer interfaces. *Science and engineering ethics*, 26(1), 351–367 und Martinovic, I., Davies, D., Frank, M., Perito, D., Ros, T., & Song, D. (2012). On the feasibility of side-channel attacks with brain-computer interfaces. In 21st USENIX Security Symposium (Usenix Security 12) (pp. 143–158). Yuste, R., Goering, S., Bi, G., Carmena, J. M., Carter, A., Fins, J. J., ... & Wolpaw, J. (2017). Four ethical priorities for neurotechnologies and AI. *Nature*, 551(7679), 159–163. Rafferty, J. (2021). Brain Computer Interfaces: A New Existential Risk Factor. *Journal of Futures Studies*, 26(2), 51–65.

48 World Health Organization (2022). Global guidance framework for the responsible use of the life sciences: mitigating biorisks and governing dual-use research. Available at: <https://apps.who.int/iris/handle/10665/362313> (last accessed: 27 September 2022).

49 Eoyang, M., & Keitner, C. (2020). Cybercrime vs. Cyberwar: Paradigms for Addressing Malicious Cyber Activity. *J. Nat'l Sec. L. & Pol'y*, 11, 327.

In 2017, a project group that also included researchers from universities and developers from Microsoft and Google published the report “The Malicious Use of Artificial Intelligence: Forecasting, Prevention, and Mitigation”<sup>50</sup>. The report sets out the growing potential for using AI to cause intentional harm. The authors describe several scenarios based on technologies that are already commercially available or will be in the foreseeable future. These include the potential of automated hacks and automated campaigns of misinformation and the use of automated drones or domestic robots for attacks. The project group recommends closer cooperation between policymakers and IT researchers on security-relevant aspects of research, so that scientific knowledge can feed into the required political decision-making. Furthermore, in cases where the potential for malicious application is foreseeable, researchers should proactively involve the relevant bodies and identify and further develop best practices for the AI field of research.

In 2018, at a conference on neuronal information processes, Canadian researchers presented the “Montreal Declaration” on handling AI. It calls on researchers and companies that develop AI to comply with democratic and ethical standards and recommends restricting public access to security-relevant algorithms: “It is necessary to develop mechanisms that consider the potential for the dual use – beneficial and harmful – of AI [artificial intelligence] research and AIS [artificial intelligent systems] development (whether public or private) in order to limit harmful uses. When the misuse of an AIS endangers public health or safety and has a high probability of occurrence, it is prudent to restrict open access and public dissemination to its algorithm.”<sup>51</sup>

In April 2019, a group of experts of the European Commission presented ethical guidelines on dealing with AI, which were expanded in June 2019 to include an “Assessment List for Trustworthy Artificial Intelligence”. The guidelines support risk-based AI governance.<sup>52</sup> Previously, the European Group on Ethics in Science and New Technologies (EGE) commented on the potential for abuse of AI, robotics and autonomous systems and called on researchers to enter into a discourse with society on ethical dilemmas.<sup>53</sup> Although the statement of the European Commission’s expert group on AI stated that AI should work for the benefit of society,<sup>54</sup> no “red lines” were defined by the expert panel. The interdisciplinary working group “Responsibility: Machine Learning and Artificial Intelligence” of the Berlin-Brandenburg Academy of Sciences and Humanities proposed a European certification process for AI in this context, balancing the

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50 Available at: <https://maliciousaireport.com> (last accessed: 27 September 2022).

51 The Montreal Declaration is available at: [https://monoskop.org/images/d/d2/Montreal\\_Declaration\\_for\\_a\\_Responsible\\_Development\\_of\\_Artificial\\_Intelligence\\_2018.pdf](https://monoskop.org/images/d/d2/Montreal_Declaration_for_a_Responsible_Development_of_Artificial_Intelligence_2018.pdf) (last accessed: 27 September 2022).

52 See [https://germany.representation.ec.europa.eu/news/neue-ethische-leitlinien-fur-kunstliche-intelligenz-vorgelegt-2019-06-26\\_de?ettrans=en](https://germany.representation.ec.europa.eu/news/neue-ethische-leitlinien-fur-kunstliche-intelligenz-vorgelegt-2019-06-26_de?ettrans=en) (last accessed: 27 September 2022).

53 See <https://op.europa.eu/en/publication-detail/-/publication/dfefe62e-4ce9-11e8-be1d-01aa75ed71a1/language-en/format-PDF/source-78120382> (last accessed: 27 September 2022).

54 See [https://ec.europa.eu/commission/presscorner/detail/en/IP\\_19\\_1893](https://ec.europa.eu/commission/presscorner/detail/en/IP_19_1893) (last accessed: 27 September 2022).

principles of precaution and innovation.<sup>55</sup> The Data Ethics Commission has also advocated pursuing a European path in the future discourse on ethics, law and technology.<sup>56</sup>

The difficulty of mitigating dual-use risks in the field of AI was recently demonstrated by researchers from a pharmaceutical research company. The authors changed the settings of an AI software, which is freely available in a similar form and is normally used for virtual toxicity testing of drug candidates for drug development, to the effect that the software specifically searches for particularly toxic molecules. This enabled the authors to identify thousands of possibly highly toxic and potentially weapons-grade substances within a few minutes with little effort.<sup>57</sup> Even if the suitability of most substances would still have to be proven through synthesis, stability testing and their systemic effect in the organism, this nevertheless shows the risks that can emanate from systems designed for peaceful use – an ambivalence that can also be observed in many other research fields.

### 5.3 Initiatives for maintaining research integrity and security

The key words “research integrity” and “research security” have given rise to a range of initiatives with the goal of safeguarding the fundamental values of the European and global science system and keeping international scientific cooperation as open as possible despite the differing political interests and goals of various countries.

For example, in 2021 the European Commission published a working paper entitled “Tackling R&I foreign interference”.<sup>58</sup> It contains strategies for universities and other research institutions for research and development with a view to countering foreign influence in the four key areas of values, governance, partnerships and cybersecurity, thereby safeguarding the interests of the European Union (EU). In 2022, a working group of the G7 states, with the participation of the Joint Committee, developed a statement entitled “G7 Common Values and Principles on Research Security and Research Integrity”,<sup>59</sup> in which existing values and principles of research security and integrity were examined and further developed with regard to security considerations. Furthermore, good practice examples for voluntary standards of conduct and best practices were collected by the working group in this context. The Organisation for Economic Co-operation and Development (OECD) also consulted the Joint Committee and, through its Global Science Forum project “Integrity and security in the global re-

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55 The statement “Vertrauenswürdige KI? Vorausschauende Politik!” is available (in German) at: [www.bbaw.de/files-bbaw/user\\_upload/publikationen/BBAW\\_\\_Vertrauenswuerdige-KI\\_Vorausschauende-Politik.pdf](http://www.bbaw.de/files-bbaw/user_upload/publikationen/BBAW__Vertrauenswuerdige-KI_Vorausschauende-Politik.pdf) (last accessed: 27 September 2022).

56 Data Ethics Commission of the Federal Government (2019). Opinion of the Data Ethics Commission. Available at: [www.bmi.bund.de/SharedDocs/downloads/EN/themen/it-digital-policy/datenethikkommission-abschlussgutachten-lang.pdf?\\_\\_blob=publicationFile&v=4](http://www.bmi.bund.de/SharedDocs/downloads/EN/themen/it-digital-policy/datenethikkommission-abschlussgutachten-lang.pdf?__blob=publicationFile&v=4) (last accessed: 27 September 2022).

57 Urbina, F., Lentzos, F., Invernizzi, C. et al. Dual use of artificial-intelligence-powered drug discovery (2022). *Nat Mach Intell* 4, 189–191. <https://doi.org/10.1038/s42256-022-00465-9> (last accessed: 27 September 2022).

58 Available at: <https://op.europa.eu/en/web/eu-law-and-publications/publication-detail/-/publication/3faf52e8-79a2-11ec-9136-01aa75ed71a1> (last accessed: 27 September 2022).

59 See “G7 Common Values and Principles on Research Security and Research Integrity”. Available at: [www.bmbf.de/SharedDocs/Downloads/de/2022/220812-g7-sigre-paper.pdf?\\_\\_blob=publicationFile&v=2](http://www.bmbf.de/SharedDocs/Downloads/de/2022/220812-g7-sigre-paper.pdf?__blob=publicationFile&v=2) (last accessed: 27 September 2022).

search ecosystem”, examined how potential conflicts of interest and obligation can be managed in international cooperation and exchange in order to strengthen the global research ecosystem.<sup>60</sup>

#### 5.4 Codes of conduct for research

The UNESCO Recommendation on Science and Scientific Researchers of 1974 was revised in late 2017. Alongside fair conditions for researchers and the free exchange of scientific data, UNESCO recommends that research and development should be carried out with a greater sense of responsibility towards humanity and the environment, and to ensure that societies make responsible use of newly acquired knowledge.<sup>61</sup>

Building on the Chemical Weapons Convention (CWC) of 1993, an expert group of chemists from 24 states presented ethical guidelines based on existing codes<sup>62</sup> in 2015. These “Hague Ethical Guidelines”<sup>63</sup> address staff from the chemical industry as well as academia and call for responsible risk management and prevention of misuse. Risk awareness is to be increased so that chemical products or their intermediates are not applied as weapons and compliance with the highest ethical standards is ensured.

The Fraunhofer-Gesellschaft and the Netherlands Organisation for Applied Scientific Research (TNO) carried out the joint EU-funded project “Joining Efforts for Responsible Research and Innovation” (JERRI)<sup>64</sup> from 2016 to 2019. The outcomes included the implementation of a Fraunhofer Ethics Commission for Security-Relevant Research<sup>65</sup> and a Code of Conduct for the TNO.<sup>66</sup>

A code of conduct for bioscientists submitted by China and Pakistan in 2016 as part of the Review Conference of the Biological Weapons Convention was further developed in cooperation with Johns Hopkins University and the InterAcademy Partnership and published in 2021 under the title “The Tianjin Biosecurity Guidelines for Codes of Conduct for Scientists”.<sup>67</sup> In accordance with the requirements of the Biological Weapons Convention, the guidelines are intended to prevent the misuse of bioscientific research internationally without hindering its positive results.

60 The corresponding report is available at: [www.oecd-ilibrary.org/deliver/1c416f43-en.pdf?itemId=/content/paper/1c416f43-en&mimeType=pdf](http://www.oecd-ilibrary.org/deliver/1c416f43-en.pdf?itemId=/content/paper/1c416f43-en&mimeType=pdf) (last accessed: 27 September 2022).

61 See Recommendation on Science and Scientific Researchers 13 November 2017. Available at: [https://en.unesco.org/themes/ethics-science-and-technology/recommendation\\_science](https://en.unesco.org/themes/ethics-science-and-technology/recommendation_science) (last accessed: 27 September 2022).

62 In 2015, the OPCW drew up an overview of the codes of conduct in place across the world in public organisations and industry. Available at: [www.opcw.org/fileadmin/OPCW/SAB/en/2015\\_Compilation\\_of\\_Chemistry\\_Codes.pdf](http://www.opcw.org/fileadmin/OPCW/SAB/en/2015_Compilation_of_Chemistry_Codes.pdf) (last accessed: 27 September 2022).

63 Available at: [www.opcw.org/special-sections/science-technology/the-hague-ethical-guidelines](http://www.opcw.org/special-sections/science-technology/the-hague-ethical-guidelines) (last accessed: 27 September 2022).

64 See [www.jerri-project.eu](http://www.jerri-project.eu) (last accessed: 27 September 2022).

65 Statutes of the Commission available (in German) at: <https://www.fraunhofer.de/content/dam/zv/de/ueber-fraunhofer/corporate-responsibility/Satzung%20KEF%20Fraunhofer-Gesellschaft.pdf> (last accessed: 27 September 2022).

66 Available at: [www.tno.nl/media/4460/tno\\_code\\_uk2.pdf](http://www.tno.nl/media/4460/tno_code_uk2.pdf) (last accessed: 30 September 2022).

67 Available at: [www.interacademies.org/sites/default/files/2021-07/Tianjin-Guidelines\\_210707.pdf](http://www.interacademies.org/sites/default/files/2021-07/Tianjin-Guidelines_210707.pdf) (last accessed: 27 September 2022).

## A. Background

In some areas, industry has already agreed to comply with international codes of conduct in order to reduce the security-relevant risks of their research, e.g. for the synthesis of nucleic acids, for the general application of biotechnology, for engineering sciences and for the application of information technology.<sup>68</sup>

Some scientific publishers and journals also ask authors and reviewers for information on the risks of misuse of submitted articles; sometimes committees set up specifically for this purpose are responsible for risk-benefit assessments and the corresponding advice to the editors.<sup>69</sup>

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68 Further information in Chapter A 6 of the Progress Report of the Joint Committee of 2018. Available at: [www.sicherheitsrelevante-forschung.org/en/publication-progressreport2018](http://www.sicherheitsrelevante-forschung.org/en/publication-progressreport2018) (last accessed: 1 November 2022).

69 See Chap. A 6 in the Joint Committee's third activity report of 2020. Available at: [www.sicherheitsrelevante-forschung.org/en/publication-progressreport2020](http://www.sicherheitsrelevante-forschung.org/en/publication-progressreport2020) (last accessed: 21 November 2022).





## B. Handling of security-relevant research at German research institutions



## 1. Tasks and objectives of the Joint Committee

For the long-term implementation of their joint “Recommendations for Handling Security-Relevant Research” (Chap. A 3), the DFG and the Leopoldina decided to set up the Joint Committee on the Handling of Security-Relevant Research in 2014. In accordance with the decisions made by the presidiums of both organisations, the Joint Committee has the following mandate:

**BOX 2.** “[...] to promote the effective and sustainable implementation of the recommendations of the DFG and the Leopoldina on “Scientific Freedom and Scientific Responsibility”. The Joint Committee shall monitor and proactively advance the status of implementation at research institutions and support them in properly implementing the recommendations by drafting sample texts, for example. This applies in particular to the establishment of the Committees for Ethics in Security-Relevant Research (KEFs – German acronym) as outlined in the recommendations.

The Joint Committee shall act as a point of contact for the KEFs for any questions and as a platform for sharing experience and knowledge. The responsibility for individual cases under discussion shall lie with the research institutions at which the work is being carried out. In special cases that cannot adequately be appraised by the KEFs, the Leopoldina may appoint ad-hoc working groups with the necessary specialist expertise to carry out a risk-benefit assessment of the research in question in close collaboration with the Joint Committee.

In addition, the Joint Committee shall monitor developments in the field of security-relevant research in Germany and, where necessary, identify potential areas for action and advise the DFG and the Leopoldina on these issues. Where necessary, Committee members will take part in public discussions. In order to focus attention on this issue over the long term, the Committee shall organise regular events to raise awareness of the responsible handling of security-relevant research within the scientific community and also including the communication to policymakers and the public.”

The Joint Committee meets regularly, usually twice a year but at least once a year. Statements and other papers such as the regular progress reports compiled by the Joint Committee are published in coordination with the presidiums of the DFG and the Leopoldina.

The Joint Committee comprises 12 scientists from various disciplines and institutions appointed for a term of three years by the presidiums of the DFG and the Leopoldina in mutual agreement. At least one member must be an expert on ethical issues and one on legal issues. The Joint Committee is headed jointly by the vice presidents of the DFG and the Leopoldina or by representatives appointed by the presidiums.

The Joint Committee office is based in the Leopoldina Presidential Office. In addition to the office expenses borne by the Leopoldina, the Joint Committee receives funding from the DFG, the Fraunhofer-Gesellschaft, the Helmholtz Association, the Leibniz Association and the Max Planck Society based on a cooperation agreement.

### **Chairpersons of the Joint Committee (as of 1 October 2022)**

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PROFESSOR BRITTA SIEGMUND, Vice President of the DFG  
PROFESSOR THOMAS LENGAUER, German National Academy of Sciences Leopoldina, appointed representative of the Leopoldina Presidium

### **Other members of the Joint Committee (as of 1 October 2022)**

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PROFESSOR STEPHAN BECKER, University of Marburg, Institute of Virology  
PROFESSOR ALFONS BORA, Bielefeld University, Faculty of Sociology  
DR UNA JAKOB, Peace Research Institute Frankfurt, Frankfurt am Main  
PROFESSOR FRANK KIRCHNER, German Research Center for Artificial Intelligence, Bremen  
PROFESSOR ANIKA KLAFKI, Friedrich Schiller University Jena, Faculty of Law  
PROFESSOR FELICITAS KRÄMER, University of Potsdam, Institute of Philosophy  
PROFESSOR FLORIAN KRAUS, University of Marburg, Department of Chemistry  
PROFESSOR LARS SCHAADE, Robert Koch Institute Berlin  
PROFESSOR JUDITH SIMON, Universität Hamburg, Chair of Ethics in Information Technology  
PROFESSOR JOCHEN TAUPITZ, University of Mannheim, Faculty of Law and Economics

### **Office of the Joint Committee (as of 1 October 2022)**

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LENA DIEKMANN, Project Coordinator, German National Academy of Sciences Leopoldina  
DR JOHANNES FRITSCH, Head of Office, German National Academy of Sciences Leopoldina  
DR ANITA KRÄTZNER-EBERT, Scientific Officer, German National Academy of Sciences Leopoldina

### **Contact persons at the German Research Foundation (as of 1 October 2022)**

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DR CHRISTIAN BAMANN, German Research Foundation  
DR INGRID OHLERT, German Research Foundation

The progress reports of 2016,<sup>70</sup> 2018<sup>71</sup> and 2020<sup>72</sup> provided detailed information on the work of the Joint Committee and on the status of implementation of the recommendations. The Joint Committee held its constitutive meeting in February 2015 and has since convened 15 times. Among those invited to attend the meetings have been representatives of the KEFs, the German Ethics Council, from bioethics and virology, from a chemicals and pharmaceuticals group, from a student initiative and from relevant federal ministries and Federal Government offices. In order to fulfil its function as a coordinating platform for the pooled exchange of experience and to create transparency about the handling of security-relevant research in Germany, the Joint Committee has set up an extensive public online platform, which it is constantly updated and expanded.<sup>73</sup> Publications and further information (e.g. topics and case studies, legal framework conditions, relevant aspects of research funding as well as education and teaching) on security-relevant research are made available there. The platform also lists the contact persons of German research institutions, organisations and science associations responsible for dealing with questions of security-relevant research, as well as the local committees and commissioners responsible for the ethical evaluation of security-relevant research.<sup>74</sup> This overview list (see also Appendix 2) provides the public and political decision-makers with an overview of how German research institutions and organisations deal with the issue of security-relevant research risks.

In order to provide guidance for establishing KEFs and their ongoing work, and to ensure that their tasks and powers are as uniform as possible according to the statutes, the Joint Committee has published model statutes for KEFs.<sup>75</sup> The model statutes identify issues requiring regulation, the details of which are to be adapted to the respective local conditions. For example, section 6(1) (“Initiating Proceedings”) of the model statutes defines the specific cases where KEFs should become active: “Members of the university/institute/association [Name] shall consult the KEF before conducting a research project where such research project is associated with considerable security-relevant risks for human dignity, human life, health, freedom, property, the environment and peaceful coexistence. Security-relevant risks exist in particular in scientific work that can be assumed to yield knowledge, products or technologies that can be directly misused by third parties.” In addition, the Joint Committee published a guide with the title “The Handling of Security-Relevant Research in Germany – An Overview”,<sup>76</sup>

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70 Available at: [www.sicherheitsrelevante-forschung.org/en/publication-progressreport2016](http://www.sicherheitsrelevante-forschung.org/en/publication-progressreport2016) (last accessed: 21 November 2022).

71 Available at: [www.sicherheitsrelevante-forschung.org/en/publication-progressreport2018](http://www.sicherheitsrelevante-forschung.org/en/publication-progressreport2018) (last accessed: 21 November 2022).

72 Available at: [www.sicherheitsrelevante-forschung.org/en/publication-progressreport2020](http://www.sicherheitsrelevante-forschung.org/en/publication-progressreport2020) (last accessed: 21 November 2022).

73 See [www.security-relevant-research.org](http://www.security-relevant-research.org) (last accessed: 21 November 2022).

74 The list can be viewed at [www.sicherheitsrelevante-forschung.org/en/contactpersons](http://www.sicherheitsrelevante-forschung.org/en/contactpersons) (last accessed: 21 November 2022).

75 The model statutes are also available online at: [www.sicherheitsrelevante-forschung.org/en/publication-modelstatutes2016](http://www.sicherheitsrelevante-forschung.org/en/publication-modelstatutes2016) (last accessed: 21 November 2022).

76 Available at: [www.sicherheitsrelevante-forschung.org/en/publication-informationbrochure2022](http://www.sicherheitsrelevante-forschung.org/en/publication-informationbrochure2022) (last accessed: 21 November 2022).

which is intended to provide researchers and the interested public with an accessible overview of handling security-relevant research.

### 2. Work of the Committees for Ethics in Security-Relevant Research (KEFs)

As of 1 September 2022, the Joint Committee has received the names of 144 contact persons responsible for security-relevant research at 156 German research institutions, research associations, science associations and one industry association. According to the information of the Joint Committee, 120 research institutions across Germany have established KEFs or comparable solutions. In some cases, one KEF or contact person is responsible for several institutions. Figure 1 shows their growth since early 2015.

In order to receive up-to-date information on progress made in establishing KEFs or comparable solutions and to learn more about their particular working methods, composition, cases and issues, the Joint Committee conducts a survey<sup>77</sup> among the contact persons every two years (see Appendix 3 for latest survey).

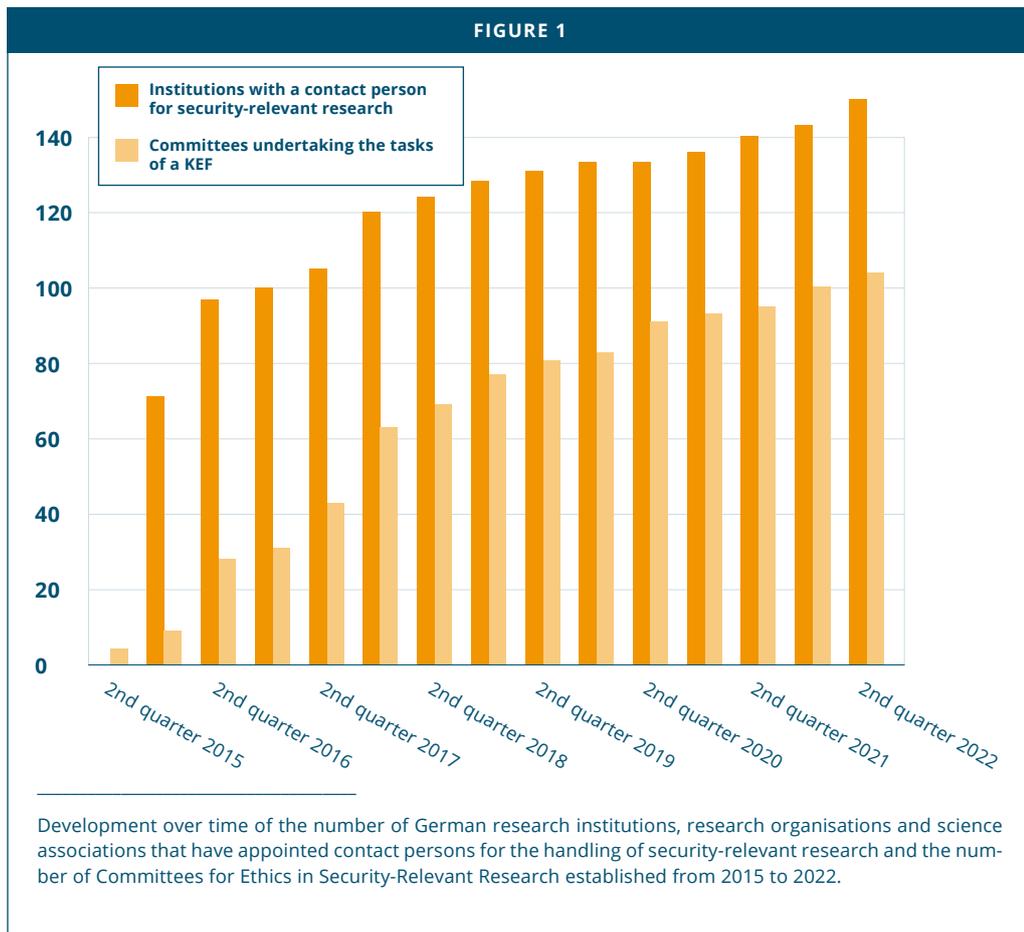
The most recent survey, which covers the period from 2020 to 2021, was completed by 82 of the 144 contact persons overall. The contact persons came from 54 universities and 26 non-university research institutions and departmental research institutes, while two contact persons came from other research institutions or science associations. Figure 2 shows the responses to the question of whether a KEF or a correspondingly responsible body has already been established. Together with the answers in the questionnaires, the statistics also included the information that was already available on the website of the Joint Committee,<sup>78</sup> which was provided mainly by the contact persons themselves.

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77 The first written survey was conducted in late 2017.

78 Available at: [www.sicherheitsrelevante-forschung.org/en/contactpersons](http://www.sicherheitsrelevante-forschung.org/en/contactpersons) (last accessed: 21 November 2022).

## B. Handling of security-relevant research at German research institutions



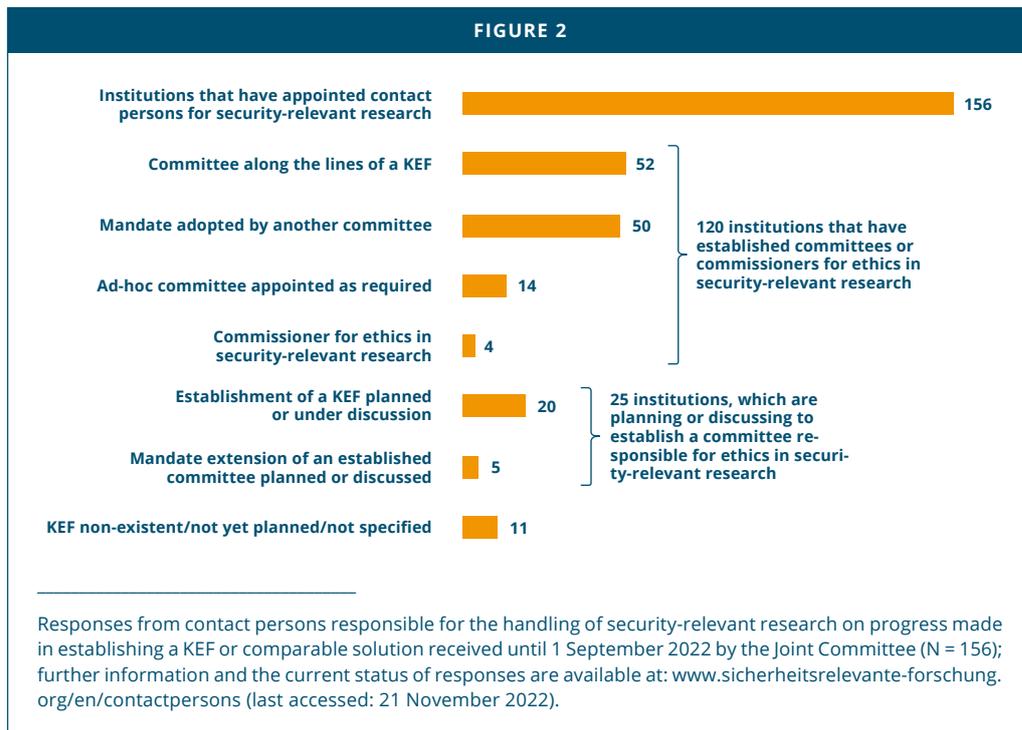
102 research institutions have so far established a permanent Committee for Ethics in Security-Relevant Research. Slightly less than 50 percent of these committees have a wider mandate than that of a KEF. The University of Leipzig has expanded its existing ethics advisory board to include a dual-use working group.<sup>79</sup> The ethics advisory board has a well-established procedure for handling ethical issues and calls in the members of the dual-use working group for security-relevant topics. According to the 2020 survey by the Joint Committee, Humboldt-Universität zu Berlin has established individual ethics committees at several faculties, which become active when consultation is needed. At the Alfred Wegener Institute for Polar and Marine Research, a “Risk Assessment Committee” has been established to advise on security-relevant aspects of research as well as on sustainability and environmental issues.<sup>80</sup> At the Friedrich Schiller University Jena, the “Committee for Environmentally and Security-Relevant Research” was established to address these and other issues.<sup>81</sup>

79 See [www.uni-leipzig.de/forschung/forschungsservice/ethikbeirat](http://www.uni-leipzig.de/forschung/forschungsservice/ethikbeirat) (last accessed: 27 September 2022).

80 See <https://www.awi.de/en/about-us/organisation/sustainability/awi-sustainability-guideline.html> (last accessed: 27 September 2022).

81 See <https://www.uni-jena.de/en/research/environmentally-and-security-relevant-research> (last accessed: 27 September 2022).

## B. Handling of security-relevant research at German research institutions



Fourteen research institutions use an ad-hoc committee to deal with ethics issues as they arise. Twenty-five institutions are either still discussing whether to establish a KEF or are planning to do so. The Leibniz Association has developed rules of procedure for a central Leibniz committee for ethics in research which were updated in 2022. As well as providing advisory services to the Leibniz institutes, this KEF is responsible for assessing research projects where the clarification of security-relevant risks has “a demonstrable relevance beyond the individual case in question in a key field of research of the Leibniz Association”.<sup>82</sup> The central KEF thus complements the KEFs already established locally at 16 Leibniz institutions. Furthermore, in 2022 the Leibniz Association appointed an Executive Board Representative for Research Ethics. Together with the Leibniz Integrity Advisory Board, this representative coordinates awareness-raising for security-relevant and ethical aspects of research and also coordinates professional development and training programmes on the topic in the area of knowledge transfer and networking within the Leibniz Association. Within the Helmholtz Association, a total of nine Helmholtz Centres have established KEFs. The Max Planck Society has set up one KEF for all 84 Max Planck Institutes. The Fraunhofer-Gesellschaft set up a central Fraunhofer Committee on Ethics in Security-Relevant Research in 2019.<sup>83</sup>

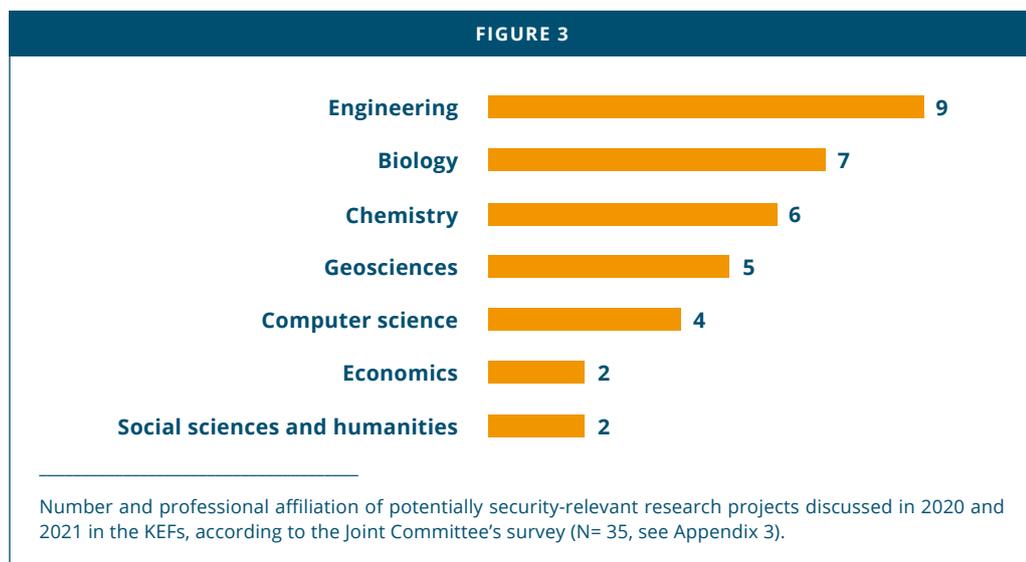
82 See [www.leibniz-gemeinschaft.de/en/about-us/leibniz-integrity/research-ethics.html](http://www.leibniz-gemeinschaft.de/en/about-us/leibniz-integrity/research-ethics.html) (last accessed: 28 September 2022).

83 See KEF Statutes, available (in German) at: [www.fraunhofer.de/content/dam/zv/de/ueber-fraunhofer/corporate-responsibility/Satzung%20KEF%20Fraunhofer-Gesellschaft.pdf](http://www.fraunhofer.de/content/dam/zv/de/ueber-fraunhofer/corporate-responsibility/Satzung%20KEF%20Fraunhofer-Gesellschaft.pdf) (last accessed: 28 September 2022).

## B. Handling of security-relevant research at German research institutions

At least four research institutions have commissioners for ethics in security-relevant research instead of a committee who are available to researchers if they have questions regarding security-relevant research. Some institutions have decided to jointly operate a KEF. The Bernhard Nocht Institute for Tropical Medicine, the Leibniz Institute for Virology and the Research Center Borstel have established a joint committee. The Hanover University of Music, Drama and Media has agreed to consult the committee of the Hanover Medical School if required. The “Joint Ethics Committee of the Universities of Bavaria” (GEHBa) offers ethics consultancy for 14 Bavarian universities. In 2021, advice on security-relevant research was included in the statutes of the GEHBa.<sup>84</sup>

The survey responses indicate that between 2020 and 2021, 16 committees responsible for ethics of security-relevant research had met to deliberate on at least 35 potentially security-relevant research projects (Figure 3). Some security-relevant cases were also discussed by the institutions’ legal departments, the offices of the vice chancellor or the vice presidents for research.



Given the results of the three surveys conducted by the Joint Committee, at least 94 research projects were deliberated in the KEFs or correspondingly responsible committees between 2016 and 2021; however, the surveys showed that security-relevant work of concern, as understood by the Joint Committee (Chap. A 1), continues to be a rare exception in academic research. The KEFs primarily addressed the compatibility of the research with basic constitutional principles or the guidelines of the respective research institution and dealt with issues of data security, sustainability and export control. They further evaluated security-relevant risks in connection with research funding provided by sponsors with military associations and risks that could arise from cooperation with partners that have military associations.

84 See (in German) [www.gehba.de/fileadmin/daten/Gehba/Satzung\\_GEHBa\\_final.pdf](http://www.gehba.de/fileadmin/daten/Gehba/Satzung_GEHBa_final.pdf) (last accessed: 28 September 2022).

## B. Handling of security-relevant research at German research institutions

Of the 35 security-relevant research projects discussed between 2020 and 2021, 17 were approved by the respective committees. In the majority of cases, no direct potential for misuse was seen, either because the committee considered the project in question to involve research that was far from application or purely basic research, or because the overall potential for harm was considered to be rather low, or because a clear benefit to civil society was expected, or because the measures for risk minimisation and ethical monitoring were considered to be adequate. For example, a KEF advised on a request from industry to participate in the development of rapid tests for modern nerve agents. The project was supported due to the defensive nature of the application. Another KEF approved a research project on exoskeletons for people with paralysis, as the devices were deemed unsuitable for warfare purposes.

Eleven of the cases discussed between 2020 and 2021 were only approved under certain conditions. For example, for experiments to determine the pathogenicity of unknown virus variants, the KEF requested regular reporting during the course of the experiments and advised omitting experiments that were expected to be particularly risky. In other research institutions, the KEFs recommended information measures for participating researchers, concluding a cooperation agreement with explicit permission to publish all scientifically relevant results, a voluntary commitment by participating researchers to continuously review their project results with regard to risks of misuse, further preventive measures to minimise risks or the early regulation of accompanying public relations work if results are published.

The committees explicitly advised against at least two proposals between 2020 and 2021. One case involved plans to award an honorary doctorate to a scientist who had carried out extensive applied military contract research. The committee found that this doctorate was not compatible with the university's civil clause. In the other case, purchasing the geophysical measurement data necessary for the project would have indirectly violated the voluntary commitment of the research institutions to work towards sustainable goals in global energy supply by supporting the seller.

One KEF was asked by the university administration to review the extent to which a strict civil clause was appropriate for the research institution. It concluded that case-by-case assessments were preferable for projects with non-civilian partners.

Some institutions used the survey to express their wish for specialised training and professional development courses on the ethics of security-relevant research. Others expressed their hope that the event formats organised by the Joint Committee so far, including workshops, KEF Forums and specialist conferences, would continue. Some expressed the wish to be able to receive competent consultation directly from the Joint Committee in particularly difficult cases. At the same time, there is a high demand for more information material, especially in the field of IT, data protection and best practices in export control. Decision-making aids for advisory processes in the form of case studies, checklists and guidelines were also requested, as well as specialised support by the Joint Committee in setting up a KEF.

### 3. Key questions and checklists for the ethical assessment of security-relevant research

#### 3.1 Review of existing key questions and checklists

According to the latest survey of the KEFs (Chap. B 2) and telephone interviews, 19 research institutions use checklists or key questions in their proposal procedures to approve or consult on security-relevant aspects of research projects. In the respective documents that are publicly accessible, different key areas depending on the profile of the research institution and the type of committee involved are covered. For instance, the focus in proposal documents by “classic” ethics committees, whose mandate has been expanded to include security-relevant aspects of research in addition to medical and psychological issues, continues to be primarily on the welfare of test subjects.<sup>85</sup> In the life sciences, in contrast, the corresponding guidelines and checklists have a clear biosafety or biosecurity focus.<sup>86</sup> At other institutions, such as the Technische Universität Darmstadt<sup>87</sup> and the Georg-August-Universität Göttingen,<sup>88</sup> the focus is partly on the compatibility of the research project with the applicable civil clause (Chap. A 4). The TU Bergakademie Freiberg has created a checklist with key questions for the early detection of different risks. These relate to the research and investigation methods used, the objectives pursued, the potential for misuse of the results and possible risks arising from cooperation with research partners, and the deployment of staff from embargoed countries.<sup>89</sup>

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85 See Carl von Ossietzky Universität Oldenburg (2019). Accompanying overview form for proposals. Available (in German) at: [https://uol.de/fileadmin/user\\_upload/gremien/EK/2019-05-09-Vollantrag-EK.docx](https://uol.de/fileadmin/user_upload/gremien/EK/2019-05-09-Vollantrag-EK.docx) (last accessed: 28 September 2022).

86 See Robert Koch Institute (2013). Hausverfügung: Dual-Use-Potenzial in der Forschung - Verfahrensregel zur Vermeidung und Minimierung von Risiken (Internal order: dual-use potential in research – code of conduct to avoid and minimise risks.). Available (in German) at: [www.rki.de/DE/Content/Forsch/Dual-Use-Risiken/hausverfuegung.html](http://www.rki.de/DE/Content/Forsch/Dual-Use-Risiken/hausverfuegung.html) (last accessed: 28 September 2022); Paul-Ehrlich-Institut (2018). Leitfaden für den Umgang mit potenziell sicherheitsrelevanter Forschung – Anhang 10 der Organisationsverfügung 2015-0 1-V03 “Grundlagen für wissenschaftliches Arbeiten und Handeln am Paul-Ehrlich-Institut” (Guideline for handling potentially security-relevant research – Appendix 10 of the Administrative Order 2015-0 1-V03 “Basic Principles for Scientific Work at the Paul-Ehrlich-Institut), (not available online); Hanover Medical School (2015). Questionnaire for DURC-relevant research (not available online).

87 Technische Universität Darmstadt (2019). Checklist for self-evaluation/documentation of a research project in relation to the civic clause. Available at: [www.intern.tu-darmstadt.de/gremien/ethikkommission/formulare\\_8/index.en.jsp#text\\_\\_bild\\_1](http://www.intern.tu-darmstadt.de/gremien/ethikkommission/formulare_8/index.en.jsp#text__bild_1) (last accessed: 28 September 2022).

88 Georg-August-Universität Göttingen (2020). Hinweise zur Antragsstellung (Tips for applications). Available (in German) at: [www.uni-goettingen.de/de/kurzhinweise+zur+antragsstellung/620559.html](http://www.uni-goettingen.de/de/kurzhinweise+zur+antragsstellung/620559.html) (last accessed: 28 September 2022).

89 See (in German) [https://tu-freiberg.de/sites/default/files/media/forschung-294/leitfragen\\_sicherheitsrelevanz.pdf](https://tu-freiberg.de/sites/default/files/media/forschung-294/leitfragen_sicherheitsrelevanz.pdf) (last accessed: 28 September 2022).

## B. Handling of security-relevant research at German research institutions

The various types of feedback from the research institutions indicate that the following complexes of topics remain significant for the evaluation of security-relevant research projects:

- Violations against legal regulations, guidelines, codes of conduct
- Involved researchers and external sponsors, e.g. international and military cooperation partners
- Weighing the risks and benefits, e.g. the probability that damage will be incurred, possible level of damage, other measures to minimise risks and the possible consequences of not conducting the research project
- The objectives and purposes of the research and the possible unintended use by third parties
- Classifying research as basic research or assessing the proximity to application and the corresponding direct potential for misuse

On this basis, and based on experience in handling security-relevant research at German research institutions, in 2020 the Joint Committee developed the following “Key questions for the ethical assessment of security-relevant research” (Chap. B 3.2), which are still valid and have, for example, already served as a template for the Key Questions of the Committee for Environmentally and Security-Relevant Research (KSUF) of the Friedrich Schiller University of Jena.<sup>90</sup>

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90 See [www.uni-jena.de/unijenamedia/key-questions-committee-for-environmentally-and-security-relevant-research.pdf](http://www.uni-jena.de/unijenamedia/key-questions-committee-for-environmentally-and-security-relevant-research.pdf) (last accessed: 28 September 2022).

### 3.2 Key questions for the ethical assessment of security-relevant research

Preamble: The key questions of the Joint Committee on the Handling of Security-Relevant Research are designed to help researchers and committees responsible for the ethics in security-relevant research (KEFs) decide in which instances a further ethical assessment of security-relevant research projects and risk reduction measures is called for. This applies particularly to so-called “security-relevant research of concern”, in other words scientific research that produces knowledge, products or technologies that could be misused directly by third parties to cause significant harm to human dignity, life, health, freedom, property, the environment or peaceful coexistence.<sup>91</sup>

In the experience of the Joint Committee, such research projects are rare exceptions in academic research. In practice, the work of the KEFs in advising security-relevant projects generally concerns the compatibility of the research with constitutional principles or the basic rules of the respective research institution and the DFG “Guidelines for Safeguarding Good Research Practice”.<sup>92</sup> They consult on issues of data security and foreign trade legislation (export control). The KEFs also assess security-relevant risks connected to military non-disclosure and to research funding from sponsors with military associations, and security-relevant risks which could arise from cooperation with researchers with military associations or from authoritarian regimes.

The Joint Committee has therefore compiled the following key questions based on the KEFs’ feedback on their own work from 2016–2019 and published checklists and guides on research risks.<sup>93</sup> The Joint Committee believes that the respective responses of researchers and KEFs and the consequences derived from them for the work in question should always be the result of case-by-case considerations under the respective local framework for research and their ethical evaluation. The Joint Committee therefore does not want to prescribe generally valid ethical criteria or “red lines” but primarily aims to sustainably strengthen the independent handling of security-relevant research risks in the sciences.

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91 Further information on security-relevant research and the work of the KEFs in the Joint Committee’s activity reports is available at: [www.sicherheitsrelevante-forschung.org/en/publications](http://www.sicherheitsrelevante-forschung.org/en/publications) (last accessed: 21 November 2022).

92 See “Guidelines for Safeguarding Good Research Practice” (DFG, as of: 28 September 2022). Available at: <https://doi.org/10.5281/zenodo.6472827> (last accessed: 28 September 2022).

93 See “Code of Conduct: Working with Highly Pathogenic Microorganisms and Toxins (DFG Permanent Senate Commission on Genetic Research 2013). Available at: [www.dfg.de/download/pdf/dfg\\_im\\_profil/geschaeftsstelle/publikationen/stellungnahmen\\_papiere/2013/130313\\_verhaltenscodex\\_dual\\_use\\_en.pdf](http://www.dfg.de/download/pdf/dfg_im_profil/geschaeftsstelle/publikationen/stellungnahmen_papiere/2013/130313_verhaltenscodex_dual_use_en.pdf) (last accessed: 28 September 2022); Scientific Freedom and Scientific Responsibility – Recommendations for Handling-Security-Relevant Research (DFG and Leopoldina 2014). Available at: [www.sicherheitsrelevante-forschung.org/en/publication-scientificfreedom2022](http://www.sicherheitsrelevante-forschung.org/en/publication-scientificfreedom2022) (last accessed: 21 November 2022); Completion aid for the civil clause checklist of TU Darmstadt (as of: 5 November 2014). Available at: [www.intern.tu-darmstadt.de/gremien/ethikkommission/formulare\\_8/index.en.jsp#text\\_\\_bild\\_1](http://www.intern.tu-darmstadt.de/gremien/ethikkommission/formulare_8/index.en.jsp#text__bild_1) (last accessed: 28 September 2022); Internal Guidelines of the Paul-Ehrlich-Institut for the Handling of Potentially Security-Relevant Research.

## Key Questions

### 1. Key questions for researchers, the answer to which may suggest the need for consultation by KEFs

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- 1.1 Is it likely that your research project is security-relevant research according to the above-specified meaning and/or the above-mentioned contexts?
- 1.2 Is it possible that cooperation partners involved in your research project will cause security-relevant risks in the above-mentioned meaning?
- 1.3 Does the research project conflict with legal regulations<sup>94</sup> and thus need to be referred to a compliance office alongside a KEF?

### 2. Key questions for processing the query by the KEFs

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- 2.1 What concrete objectives and purposes are the researchers and any sponsors involved pursuing with this research project?
- 2.2 Is the required expertise available to make an informed assessment of the research project in regard to its potential risks or does additional expertise need to be brought in?
- 2.3 Is it possible to adequately specify and weigh up the benefits and risks of the known and potential research findings with the information currently available?
- 2.4 Are the security-relevant outcomes and resulting risks of the research project new or could they also arise from previously published work?
- 2.5 How likely is it that the security-relevant findings will be disseminated and that this will lead to a direct<sup>95</sup> concrete misuse in the above-specified meaning of security-relevant research of concern?
- 2.6 In the event of an intentional harmful application of the findings through third parties, what would be the scale of the potential damage and are any suitable countermeasures<sup>96</sup> available?
- 2.7 What are the potential harmful consequences<sup>97</sup> of not carrying out the research project?

### 3. Key questions for the conclusive assessment and consultation by the KEFs

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- 3.1 Can the research project produce knowledge, products or technologies that could very likely be misused directly by third parties to cause significant damage of the above-specified legal interests?
- 3.2 Should the project be reassessed by the KEF at a more advanced stage when the security-relevant risks can be judged more easily?
- 3.3 Are the research project and its objectives and purposes compatible with the constitutional principles and the basic code or guidelines of the research institution?
- 3.4 Can the security-relevant risks be sufficiently reduced by imposing certain conditions on the project (e.g. usage agreement or alternative research strategy) or by adapting the publication?
- 3.5 How can the researchers involved in the research project be made aware of the ethical aspects of security-relevant research so that they consider the direct and future consequences of their work?

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94 E.g. regular criminal law, export control legislation and export provisions of the German Federal Office of Economics and Export Control (BAFA), the Biological Weapons Convention and the Chemical Weapons Convention, the protection of human rights, humanitarian international law, rules of war, prohibition of torture and violence, Biodiversity Convention.

95 To be considered here are e.g. the necessary capabilities, specialist knowledge and technical equipment for misuse.

96 E.g. measures of recovery and traceability and damage limitation.

97 Can the absence of certain innovations result in additional damage, for example, in the course of ongoing military conflicts, in the course of climate change, in naturally emerging waves of infection?

#### 4. Integrating the ethical considerations of security-relevant research in education and teaching

Researchers can only make an adequate assessment of the security-relevant aspects of their work if they understand the problems involved and are aware of potential risks. Surveys and studies by the National Research Council in the USA on the life sciences showed that the majority of researchers were unable to actively reflect on security-relevant aspects of their work because they lacked the necessary awareness.<sup>98</sup> In the Joint Committee's survey (Chap. B 2), too, only a small number of institutions stated that they addressed the topic of security-relevant research in their teaching. Many institutions would like the Joint Committee to provide, or refer to, relevant material and training to consolidate the topic in their courses.

In order to sensitise students to the ethical dimensions of security-relevant research at an early stage, higher education institutes and universities should incorporate the topic in their teaching and in the curricula of all relevant courses of study. A three-stage procedure is suitable for this: 1. Bachelor's degree courses could include interdisciplinary security-relevant aspects of research in general lectures on "good scientific practice" and on basic issues of ethics in science. 2. Masters' degree courses could then include seminars on the specific ethical and security-relevant aspects of their own subject, both on the theoretical level and using case studies (see case studies in Appendix 1). 3. PhD students, in particular, as well as postgraduates and staff involved in research could additionally be instructed on the specific risks of their research in group seminars, further training measures, summer schools or graduate schools. However, it is equally useful to understand the ethical aspects of research and the special responsibility of researchers as a necessary integrative component of all subject-related teaching.

The Technical University (TU) of Dortmund has already included a mandatory module on ethics in its masters' degree programmes in bioengineering and chemical engineering. This module teaches the basics of practical philosophy as part of professional training and focuses on conflict decisions. Topics include codes of conduct from the chemical industry and current technical ethics issues.<sup>99</sup> In the summer semester 2022 and winter semester 2022/23, the Institute of Philosophy at Heinrich Heine University Düsseldorf is offering a seminar on the topic of "Research Ethics", where the responsibility of researchers towards society as well as technology assessment will be discussed under consideration of benefits and risks. Philosophical considerations will be illustrated by current case studies.<sup>100</sup>

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98 National Research Council (2010). Challenges and Opportunities for Education about Dual Use Issues in the Life Sciences. Available at: [www.nap.edu/catalog/12958/challenges-and-opportunities-for-education-about-dual-use-issues-in-the-life-sciences](http://www.nap.edu/catalog/12958/challenges-and-opportunities-for-education-about-dual-use-issues-in-the-life-sciences) (last accessed: 28 September 2022).

99 See (in German) <https://bci.tu-dortmund.de/storages/bci/r/Modulhandbuch/MHB-BCI-03-2022.pdf> (last accessed: 28 September 2022).

100 See <https://lsf.hhu.de/qisserver/rds?state=verpublish&status=init&vmfile=no&publishid=227520&moduleCall=webInfo&publishConfFile=webInfo&publishSubDir=veranstaltung&noDBAction=y&init=y> (last accessed: 28 September 2022).

## B. Handling of security-relevant research at German research institutions

The TU Berlin held several courses on ethics in engineering in the summer semester of 2022. For instance, it offered a project seminar “Introduction to Technology Ethics and Technology Assessment: Focus on Automation, AI, Robotics”, in which the basics of technology ethics were taught and which included workshops on scenario development, value assessment and critical design thinking.<sup>101</sup>

The Faculty of Computer Science at TU München offered the seminar “Ethics for Nerds” in the summer semester of 2022.<sup>102</sup> This included discussions on the dangers of information technology research such as the social scoring system in China and modern weapons systems. On its website, the German Informatics Society presents case studies on ethical problems that can arise in IT research. The detailed explanation of each case is followed by ethical questions that can be discussed in seminars, for example.<sup>103</sup> In addition, an interdisciplinary student group “Think Tech” has been founded at the TU Munich, which deals with ethical issues in artificial intelligence.<sup>104</sup> The Department of Informatics at the Universität Hamburg has its own section “Ethics in Information Technology” with a wide range of courses.<sup>105</sup>

Several institutions have created training material for students, PhD students and researchers to work through by themselves. The University of Bradford, for example, offers a modular education tool on bioethics, which provides extensive information on DURC and biosecurity and presents several case studies on the misuse of biological research. It also includes detailed introductory texts. Each module concludes with questions for participants to answer.<sup>106</sup> A more interactive approach is taken by the University of Bath, which has added an online learning module to the web platform “FutureLearn”. The six-week course includes short videos mainly showing interviews with experts, discussions, texts and quizzes.<sup>107</sup> The Friedrich-Loeffler-Institut provides a training course on DURC and biosecurity in 42 slides on its homepage.<sup>108</sup> The Joint Committee has also provided a free-to-use set of slides<sup>109</sup> and an information brochure<sup>110</sup> on its website to support education and teaching, which present case studies alongside relevant terminology and framework conditions for security-relevant research.

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101 See (in German) [https://moseskonto.tu-berlin.de/moses/modultransfersystem/bolognamodule/beschreibung/anzeigen.html;jsessionid=bdKS7DQeMVmkt1UG\\_pEpY2Z5T8VJAw7FDsT-RH1.moseskonto?nummer=50948&version=1&sprache=2](https://moseskonto.tu-berlin.de/moses/modultransfersystem/bolognamodule/beschreibung/anzeigen.html;jsessionid=bdKS7DQeMVmkt1UG_pEpY2Z5T8VJAw7FDsT-RH1.moseskonto?nummer=50948&version=1&sprache=2) (last accessed: 28 September 2022).

102 See [https://campus.tum.de/tumonline/ee/ui/ca2/app/desktop/#/slc.tm.cp/student/courses/950604240?ctx=design=ca;lang=en&\\$scrollTo=to\\_c\\_overview](https://campus.tum.de/tumonline/ee/ui/ca2/app/desktop/#/slc.tm.cp/student/courses/950604240?ctx=design=ca;lang=en&$scrollTo=to_c_overview) (last accessed: 28 September 2022).

103 See (in German) <https://gewissensbits.gi.de/> (last accessed: 28 September 2022).

104 See [www.thinktech.ngo/](http://www.thinktech.ngo/) (last accessed: 28 September 2022).

105 See [www.inf.uni-hamburg.de/en/inst/ab/eit/teaching.html](http://www.inf.uni-hamburg.de/en/inst/ab/eit/teaching.html) (last accessed: 28 September 2022).

106 See <https://www.bradford.ac.uk/bioethics/educational-module-resources-emr/english-language-version-of-educational-module-resource-emr/> (last accessed: 28 September 2022).

107 See [www.futurelearn.com/courses/biosecurity](http://www.futurelearn.com/courses/biosecurity) (last accessed: 28 September 2022).

108 See (in German) [www.openagrar.de/receive/openagrar\\_mods\\_00049055?q=DURCpdf](http://www.openagrar.de/receive/openagrar_mods_00049055?q=DURCpdf) (last accessed: 28 September 2022).

109 See [www.sicherheitsrelevante-forschung.org/bildung-lehre](http://www.sicherheitsrelevante-forschung.org/bildung-lehre) (last accessed: 1 November 2022).

110 The information brochure “The Handling of Security-Relevant Research in Germany – An Overview” (2022) is available at: [www.sicherheitsrelevante-forschung.org/en/publication-informationbrochure2022](http://www.sicherheitsrelevante-forschung.org/en/publication-informationbrochure2022) (last accessed: 1 November 2022).

## B. Handling of security-relevant research at German research institutions



## C. Events and other activities of the Joint Committee

## 1. Dual use in chemistry research: opportunities, risks and responsibility

At an online workshop on 31 May 2021, which was held together with the German Chemical Society (Gesellschaft Deutscher Chemiker, GDCh), the chairs of the Joint Committee Britta Siegmund and Thomas Lengauer first outlined its tasks and objectives. GDCh Executive Director Wolfram Koch recalled the chequered history of chemical research and its potential for abuse, for example in the Haber-Bosch process, which on the one hand helped to improve global nutrition through fertiliser production, and on the other was the basis for the production and use of explosives in the First World War.

Matthias Epple from the University of Duisburg-Essen presented the opportunities and risks of nanomaterials in his lecture. One important field of application was nanomedicine, where nanoparticles were injected to fight tumours, for example. This application enabled toxins to target tumours and, ideally, destroy them. Cells could ingest nanoparticles, including lipid nanoparticles containing, for instance, mRNA vaccines against SARS-CoV-2. Other nanoparticles have also long since arrived in our everyday lives, such as in toothpaste and sunscreen. The risks of nanoparticles being deposited in cells depended on the substances in question. Additionally, he pointed out that it must be emphasised in the public debate on nanoparticles that the absence of a risk cannot generally be scientifically proven. An audience member added that the discussion around nanoparticles was suffering from a general misunderstanding. Sometimes it did not matter whether harmful particles fall under the definition of nanoparticles due to their size or not.

Clemens Walther from Leibniz University Hanover posed the question “Is the atom still our friend?”, based on a 1956 book for young readers, and used it to address the birth defect of radiochemistry, namely the production and use of nuclear bombs. He went on to say that the medical application of radiochemistry, such as the use of radium to treat cancer, nevertheless showed great benefits, and that the industrial application of radioactivity in tracers, thickness or density measurement was now ubiquitous. In research, radiochemistry was used in radioecology or nuclear forensics. Strict regulation and control prevailed in civil research. The main focus was on the potential for misuse in export control, because even basic research could unintentionally contribute to the production of weapons of mass destruction. Walther emphasised that researchers had little influence on the subsequent use of their research results and at the same time were under considerable pressure to publish. One discussion participant emphasised that researchers could not conduct technology assessment alone, but that groups of experts were needed for this. When asked about accompanying research on radiochemistry, Mr Walther said that close ethical monitoring was common in applied research. Some of the research on hazard prevention was subject to secrecy.

In his presentation, independent consultant Ralf Trapp used the example of trade in industrial chemicals to point out that toxic substances were already used in wars in ancient times. When thinking about the responsibility of science, one must also take historical components into account. At this point, he referred to Fritz Haber, who also

## C. Events and other activities of the Joint Committee

acted as a chemical weapons advisor during the First World War. The chemical weapons programme in Syria was developed in the 1970s – supported by Iran and the Soviet Union. Although Syria joined the Chemical Weapons Convention in 2013, there were already indications of the use of chemical weapons in Syria during the first review. Germany had supplied preliminary products to Syria from 2002 to 2006. After 2018, there were further deliveries from Germany, Brussels and Switzerland with source materials that were initially classified as harmless under export control law. This showed that the legal approach needed to be expanded to strengthen the Chemical Weapons Convention (CWC) and its verification system. The Convention should be considered not only in the area of list materials, but also beyond that in the export of “knowledge”. At the same time, the industry should strengthen its self-regulation and awareness-raising. Ralf Trapp explained that developments taking place precisely at the interface between chemistry and biology could also be misused in a state chemical weapons programme. Researchers had little awareness of the potential for abuse, and training in this area was needed. Florian Kraus from the Joint Committee asked whether it was at all possible to prevent misuse, even with less toxic substances. In Trapp’s opinion, trade and production should pay more attention to their customers (or other potential users of their chemicals).

Una Jakob from the Peace Research Institute Frankfurt first explained the framework of the CWC in her presentation on the impact of the CWC. This had been agreed in 1992 after about 20 years of negotiations and had been in force since 1997. The only non-signatories were Egypt, Israel, North Korea and South Sudan. The CWC also included mechanisms of verification and sanctions and was currently the most successful disarmament agreement. It was continually being adapted, for example after the incident in which a Russian dissident was poisoned with Novichok. The CWC only concerned states and not non-state actors. It also posed special challenges for science. Cooperation between industry and research continued to be necessary. In addition, there were disputes about the interpretation of the CWC, for example about non-lethal chemical weapons that attack the nervous system. Scientific expertise should make political discussions more objective. New technologies and the overlapping of research fields would create new potentials for abuse, which must be further clarified. Publications and the exchange of information were important for free research, but possible misuse should always be taken into account.

Julia Dietrich from the FU Berlin presented challenges for raising awareness of research risks in chemistry degree programmes. She presented a project that investigated the teaching of ethical aspects in science courses. Only about 6 percent of credit points addressed ethical aspects – and mostly only in the compulsory elective module. According to the survey, 25 of 31 natural science degree programmes had no ethics courses at all. Only two out of 31 courses had compulsory courses on ethics. In contrast, ethics had been firmly anchored in medical courses and biology for years. The integration of ethics in teaching usually lacked support from the management level. Dietrich pleaded for an interdisciplinary, basic ethical education. For example, she has developed a learning platform on genome editing in humans, which

could also be transferred to other topics and scientific fields.<sup>111</sup> She added that science and ethics were not opposed to each other, but should always be seen as part of each other. The management level should create corresponding obligations – by means of conferences, networking and adequately equipped job profiles. Larger learning platforms and a certificate system could be helpful.

Hans-Georg Weinig from the GDCh presented the development of the Hague Ethical Guidelines. They were created in connection with the 100th anniversary of the first massive chemical weapons attack in Ypres. The first step in developing the guidelines had been to conduct a cluster analysis of existing codes of ethics for chemical research worldwide and to agree on the most important core elements. Now the implementation of the completed ethics guidelines was important. He added that learning modules<sup>112</sup> had been made available for this purpose, for instance, and that corresponding consultations on teaching and dissemination of the guidelines were taking place. In order to further strengthen their implementation, they should find their way into the curricula of degree programmes.

In the discussion that followed, it was noted that ethical questions might not be very tangible for students, and a discussion arose about whether questions of research ethics should be approached in school or only at university, for instance from the Master's programme onwards. Felicitas Krämer from the Joint Committee added that corresponding compulsory modules were already established in all engineering degree programmes in the Netherlands. A member of the audience commented that it would be difficult to implement these demands without additional staff. Moreover, the time available to teach subject content in the degree programmes was limited. Mr Lengauer pointed out that ethics did not necessarily have to be addressed within separate courses, but that ethical content could and should also be integrated into the core courses. This applied in particular to AI teaching as a whole.

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111 See (in German) <https://userblogs.fu-berlin.de/genome-editing/> (last accessed: 28 September 2022).

112 See [www.opcw.org/opcw-e-learning](http://www.opcw.org/opcw-e-learning) and [www.opcw.org/hague-ethical-guidelines](http://www.opcw.org/hague-ethical-guidelines) (each last accessed: 28 September 2022).

## 2. Biometrics and personal rights

The Leopoldina Lecture on 18 October 2021 at Herrenhausen Palace in Hanover, organised jointly with the Volkswagen Foundation, was intended to discuss the potentials and risks of biometric identification methods for privacy.<sup>113</sup> First, Thomas Lengauer, chair of the Joint Committee, introduced the topic – from the early days of forensics, when fingerprints were used for reliable identification, to today's use of people's movement patterns and other physiognomic features such as facial shape and iris, for example in online banking. Jessica Heesen from the International Centre for Ethics in the Sciences and Humanities at the University of Tübingen spoke about how biometric data was increasingly finding its way into digital space, which was actually perceived as incorporeal. This meant that anonymity and freedom on the internet gave way in part to a system in which algorithms decided on visibility and representation in internet communication partly on the basis of biometric characteristics. This entailed the risk that certain groups of people would be discriminated against. Biometric databases and corresponding identification procedures had long been used in some countries such as China for mass surveillance, profiling of individuals and repression. It was important to protect the collected data from misuse.

Christoph Busch from the Department of Computer Science at Darmstadt University of Applied Sciences echoed this and spoke about how fairness concerning age, ethnicity and gender could be maintained in biometric decision-making procedures. The corresponding AI systems should be transparent and used as assistance systems, but not as decision-makers, and their research and development should always take private rights into account. Thomas Lengauer added that genetic data and the way people operated their computer keyboards could also be used to identify them. The subsequent discussion with the audience focused on balancing personal rights and security interests. If one expects the authorities to use the technical possibilities for law enforcement by means of biometric methods such as facial recognition, one must also live with the consequences. Surveillance by means of camera technology, however, often only resulted in crime being relocated instead of being prevented.

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113 A detailed conference report and recording of the event is available (in German) at: [www.volkswagenstiftung.de/veranstaltungen/veranstaltungsberichte/biometrieforschung-verantwortungsbewusstsein-f%C3%BCr-digital-erfasste-k%C3%B6rper](http://www.volkswagenstiftung.de/veranstaltungen/veranstaltungsberichte/biometrieforschung-verantwortungsbewusstsein-f%C3%BCr-digital-erfasste-k%C3%B6rper) (last accessed: 28 September 2022).

### 3. Science for questionable purposes? Dual use and its consequences

On 17 February 2022, the online event “Science for questionable purposes? Dual use and its consequences” was held as part of the Leopoldina discussion series “On Freedom and Responsibility in the Sciences”.<sup>114</sup> It was organised by the Leopoldina Committee on Science and Ethics and the Leopoldina Centre for Science Studies in cooperation with the Joint Committee.

The main questions were, on the one hand, to what extent individual researchers can bear responsibility for the consequences of their research and which institutions could relieve them of some of this responsibility. The participants discussed on the other hand whether and how legal regulation of research was possible and appropriate.

Florian Kraus from the Institute of Inorganic Chemistry at the University of Marburg and member of the Joint Committee was of the opinion that regulation was possible and reasonable in certain respects – examples of this were the Chemical Weapons Convention and export control lists of the Federal Office of Economics and Export Control (BAFA), but that in many areas of research, such as the development of new chemical compounds, legal regulation was neither realistic nor expedient. Carsten Reinhardt, historical science researcher at the University of Marburg, agreed with this position in essential points and supported it with examples from the history of science. He argued for a transparency obligation with regard to research cooperations, for example to disclose the cooperation of German research institutions with military institutions or otherwise high-risk actors. The question of the extent to which responsibility for the consequences of dual-use research lies with individual researchers on the one hand and, for example, research institutions and policymakers on the other, could not be answered conclusively.

Towards the end of the discussion with the audience, the spotlight fell on the question of the relationship between dual-use and defence research. While Kraus suggested differentiating between exclusively defensive military research and research that could also be used for offensive purposes, Reinhardt was sceptical that there could be such a thing as purely defensive research. To illustrate this, he cited the development of the gas mask, which enabled German troops to use gas as a combat agent against enemy troops in the First World War in the first place.

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114 A recording of the event is available at: [www.youtube.com/watch?v=dX8ncyJr3V4&list=PLaCuDJ8AkAoOUZSwls2fe\\_hjDI5-tgM4y&index=1&t=2s](https://www.youtube.com/watch?v=dX8ncyJr3V4&list=PLaCuDJ8AkAoOUZSwls2fe_hjDI5-tgM4y&index=1&t=2s) (last accessed: 28 September 2022).

#### 4. Forum for the Committees for Ethics in Security-Relevant Research (KEFs)

During the introduction to the one-day event for the KEFs, which was held in cooperation with the German Electron Synchrotron (DESY) on 25 April 2022 at its premises in Hamburg, Helmut Dosch, Chairman of the DESY Directorate, explained that DESY had committed itself to peaceful purposes in its guidelines for research. In recent years, research cooperation with foreign partners, especially with China, had received increased attention. The DESY Commission for Ethics in Research offered advice in the field of tension between scientific freedom, ethical values and legal rights.

The chairs of the Joint Committee gave further introductions to the topics of the day and presented the initial results of the Joint Committee's survey, which was intended to record the activities of the KEFs and, in particular, security-relevant research projects that were being deliberated on in 2020/21 (see also Chap. B 2). There continued to be relatively few security-relevant cases at the research institutions that give cause for concern. However, in many cases there was still a lack of awareness among researchers when it came to recognising possible risks and contacting the responsible KEF if necessary. At the same time, KEFs should present themselves more proactively as contact points for ethical research issues.

A representative of the DLR Institute for the Protection of Maritime Infrastructures presented the ELSA research (ELSA = Ethical, Legal and Social Aspects) at the DLR. This initially ensured integrated accompanying research, prepared legal and ethical opinions and trained or sensitised staff. In addition, ELSA research involved relevant expert groups at an early stage. Finally, the development of methods for ethical accompanying research was also planned in order to enable ethically secured cooperation and interdisciplinary networking. Topics such as "trustworthy AI", neuroethics, autonomous systems, learning systems, etc. would be addressed in particular. In parallel, the DLR was currently setting up a KEF. Ethical accompanying research was sometimes also carried out on behalf of industry partners in return for appropriate financial compensation. The consultation and documentation procedure of the planned KEF had already been developed. The increasing awareness of researchers would be decisive for the utilisation of the KEF.

The chairperson of the KEF at DESY explained the composition of the panel and a guideline for submitting proposals to the KEF. In addition to security-relevant cases, an animal experiment at DESY was also deliberated by the KEF. The KEF always asked in advance whether formal and legal questions had been clarified. In one case involving the acquisition of research-related material from a company with a non-civilian division, it had also played a role whether the material was also available from another civilian-oriented company and whether only a certain device would be used. The KEF had ultimately recommended that legal advice be sought regarding the necessary contractual clauses. The main goals of the KEF were to offer advice to researchers and to sensitise them to security-relevant issues in a culture of exchange and communication.

Representatives of the Karlsruhe Institute of Technology (KIT) reported on the consultation on a project from automated image evaluation, in which moving images were to be selected with the help of eye movements and EEG. The purpose of the project was stated as supporting paralysed people. Since the researcher was also connected to military lobby organisations, the committee remained concerned that the expected research results could also be used for military purposes, such as to control combat drones, even though this could not be proven. The KEF of the KIT had wished to be updated about results and areas of application midway through the project. Another case for consultation involved the development of secure cloud solutions for infrastructures, including the identification of possible security gaps. At the same time, the results were to allow state security agents to track down information on the respective hackers in the case of serious crimes. Because of this obvious dual use, a high degree of transparency and early ethical consultation had been crucial.

The chair of the KEF of the Research Centre Jülich, founded in 2021, reported on a project on hydrogen technologies in the field of basic research involving an industrial partner with military activities. An important question for the KEF was whether the technology is also suitable for mobile military vehicles. Questions of transparency and publications were also clarified. As a consequence, the Research Centre Jülich had developed a self-assessment guide for researchers. The majority of the enquiries were aimed at finding the right contact person. On the question of whether the classification of a project as basic or applied research is decisive for its ethical evaluation, there was still too little experience available. Gain-of-function experiments on viruses were definitely security-relevant, although they were mostly assigned to basic research. The exchange with the export control officer and the international department at the Research Centre Jülich was also important. A civil clause in the shareholder agreement of the Research Centre Jülich had also been reviewed by the KEF.

Cyra Ossenkopp from BAFA reported on BAFA's initiative on export control in academic research. Scientific freedom did not exempt researchers from export control obligations. The potential for misuse of the respective research was the only decisive factor, regardless of the noble goals of researchers. Export control was currently gaining importance due to the global armament. BAFA's manual "Export Control and Academia"<sup>115</sup> was being revised in light of the EU's new Dual-Use Regulation, supplemented with further practical examples and to be published in due course. In addition, BAFA wanted to engage with the advisory needs of research institutions and universities at its on-site road show. When asked about differentiating between tangible and intangible transfer of goods in practice, Ossenkopp replied that there remained a considerable need to raise awareness among researchers, for example about the fact that even sending emails could constitute an export of technology. This was also true for other EU member states. Therefore, corresponding awareness-raising measures would also be carried out at EU level.

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115 See [www.bafa.de/EN/Foreign\\_Trade/Export\\_Control/Export\\_Control\\_and\\_Academia/export\\_control\\_academia\\_node.html](http://www.bafa.de/EN/Foreign_Trade/Export_Control/Export_Control_and_Academia/export_control_academia_node.html) (last accessed: 28 September 2022).

### C. Events and other activities of the Joint Committee

A member of the DFG Head Office presented the DFG's multi-stage proposal process. With 20,000 proposals in 2021, there had been only a handful of research papers in which an immediate risk of misuse had to be evaluated. This would not be a direct reason for rejecting DFG proposals, but measures to minimise risk, KEF advisory votes and the assessment of reviewers would be explicitly requested. The decision for or against funding was always made by the DFG's Joint Committee (Hauptausschuss). On the question of what risk-minimising measures could look like, she explained that, for example, publications could be made at a later date after a detailed assessment of risks, a different research strategy could be pursued or a cooperation agreement could be concluded to minimise risks. The Proposal Preparation Instructions suggested clarifying export control issues independently in advance, for example with the local export control officers or BAFA. The DFG did not provide this kind of clarification.

The closing discussion focused on whether the research funding of the EU or the BMBF also demanded ethics approvals. An "Ethical Self-Assessment" was required in the Horizon Europe funding programme (see also Chap. A 4.3), but this was not the case for BMBF projects, although the BMBF required a voluntary commitment to follow the "DFG Guidelines for Safeguarding Good Research Practice", which addressed this issue. Meanwhile, ethics approvals were sometimes required for publication in journals. The panel suggested finding stronger differentiation criteria between DURC and military research. Instead of exerting pressure on researchers, more emphasis should be placed on advice. Compliance with the ELSA principles could play an important role in funding decisions. In addition, the conference participants spoke out in favour of anchoring the ethics of security-relevant research more firmly in education and teaching in the future. The German Rectors' Conference, for example, could be involved in this.

## 5. Participation of the Joint Committee in public debates and other events on handling security-relevant research

Between October 2020 and September 2022, the Joint Committee members and office staff actively participated in public debates and other events on the handling of security-relevant research with the following contributions:

- 2020-10-07: Exchange with the Ethics Committee and subsequent public lecture at the Brandenburg University of Technology Cottbus-Senftenberg
- 2020-11-04: Participation in the event “Capturing Technology. Rethinking Arms Control” by the Federal Foreign Office (online)
- 2021-02-24: Conducting an advanced training event on ethical aspects of security-relevant research for the Research Training Group of the Leibniz Institute of Neurology in Magdeburg
- 2021-04-20/21: Moderation at the National Dialogue Forum on the Biological Weapons Convention, organised by the Federal Foreign Office (online)
- 2021-05-31: Organisation of the event “Dual Use in chemistry Research: opportunities, risks and responsibility” (online)
- 2021-06-01: 12th meeting of the Joint Committee in Berlin (hybrid)
- 2021-06-21: Keynote speech on security-relevant research and the work of KEFs at an event of the Commission for Ethics in Research at the University of Passau (online)
- 2021-09-08: Lectures at the event series “Framework Conditions for Successful Cooperation with China” organised by the BMBF and the HRK (online)
- 2021-09-30: Lecture at the “Medical Biodefense Conference Munich”, organised by the Institute for Microbiology of the German Armed Forces (hybrid)
- 2021-10-18: Organisation of the Leopoldina Lecture “Biometrics and Personal Rights” in Hanover
- 2021-10-28: Lecture at the meeting of the Joint Ethics Committee of the Universities of Bavaria (online)
- 2021-10-28: Opening lecture of the lecture series “Ambivalence of Science”, organised by the FU Berlin
- 2021-11-16: 13th meeting of the Joint Committee (online)
- 2021-11-22: Lecture at the “Global Science Forum Workshop: Integrity and security in the global research ecosystem: managing conflicts of interest and conflicts of commitment” of the OECD (online)
- Late 2021: Participation in two working groups of the “WHO Global Guidance Framework on the responsible use of life sciences” (online)
- Late 2021: Participation in a G7 working group “Security and Integrity of the Research Ecosystem (SIGRE)” (online)

### C. Events and other activities of the Joint Committee

- 2022-01-04: Presentation and exchange at a meeting of the Leibniz Integrity Advisory Board (online)
- 2022-02-17: Leopoldina Talk: “Science for dubious purposes? Dual use and its consequences”(online)
- 2022-03-07: Presentation and exchange at a meeting of the Dual-Use Working Group of the Flemish Universities in Belgium (online)
- 2022-04-25: Third KEF Forum in collaboration with DESY in Hamburg
- 2022-04-26: 14th meeting of the Joint Committee in Hamburg
- 2022-04-29: Lecture and exchange at the annual conference of the Federation of German Scientists in Berlin
- 2022-05-17: Contribution to the discussion at the 4th China Exchange Meeting of the Federal Government and the Federal States at professional level: “Chinese Science Policy: Dealing with Challenges in Science Cooperation incl. Cooperation Agreements” of the BMBF (online)
- 2022-06-02: Expert discussion in the WIKOOP-INFRA project (Ensuring safe, transparent and mutually beneficial collaboration with China at analytical research infrastructures) of the German Electron Synchrotron DESY and the German Institute for Global and Area Studies (GIGA) (online)
- 2022-06-30: Presentation at the symposium “Next Steps in Building the Future of UK-German Scientific Collaboration”, organised by the Helmholtz Association and the British Embassy in Berlin
- 2022-08-29: 15th meeting of the Joint Committee (online)
- 2022-09-15: Lecture at the event “Dual-Use in international science cooperation: The changes in the Dual-Use Regulation – challenges for the scientific community and implications in cooperation practice”, organised by DAAD (online)
- 2022-09-26 Participation in the “CBWNet Transfer Partner Workshop”, organised by the Institute for Peace Research and Security Policy in Berlin



## D. Results and future tasks of the Joint Committee

Observing and strengthening ethical principles and values in (security-relevant) research is becoming increasingly important internationally. This is reflected in the increasing number of programmes, committees and legislative initiatives (see Chap. A 2, A 4 and A 5) as well as the numerous requests to the Joint Committee for cooperation (Chap. C 5). In German policy and research funding, particular attention is paid to aspects of export control and research cooperation with foreign partners (Chap. A 4.1). Security-relevant research and the associated risks are developing at a dynamic pace, with additional momentum through new synergies between different disciplines such as AI research, biometrics research, engineering sciences, and molecular biology (Chap. A 5 and C 2). In line with its mandate (Chap. B 1), the Joint Committee will continue to monitor security-relevant research, identify potential areas for action and advise the DFG and the Leopoldina on these issues.

### **1. Long-term strengthening of self-governed handling of security-relevant research**

The work of the Joint Committee, particularly its efforts to strengthen the self-governed handling of security-relevant aspects of research at German research institutions (Chap. B 2), is highly valued by the presidiums of the DFG and the Leopoldina, as well as the non-university research organisations. This is why, in addition to the Leopoldina and the DFG, the Fraunhofer-Gesellschaft, the Helmholtz Association, the Leibniz Association and the Max Planck Society also encourage their members to support the goals of the committee, strengthen their self-governance in dealing with security-relevant research and support the office of the Joint Committee within the framework of a cooperation agreement.

As described in Chapter B 2, the Joint Committee has gathered a list of more than 140 contact persons over the last seven years who are responsible for the handling of security-relevant research at German research institutions and organisations, science associations and one industry association. More than 100 committees or commissioners have been appointed as responsible for the ethical assessment of security-relevant research. However, the deficits that previous Joint Committee surveys have already revealed are far from being remedied. Many research institutions continue to lack mechanisms and resources to ensure the acceptance and visibility of the KEFs and to secure the continuity of the relevant procedures. The latter point is crucial to ensure that the expertise gained in the handling of security-relevant research is not lost, for example in case of a change of staff in the vice chancellery or vice presidency for research and teaching, or in case of a change in the legal framework at universities. This means that even now that KEFs have been established nationwide, it remains a key task of the Joint Committee to monitor the professional handling of security-relevant research at German research institutions. The Joint Committee will also continue to serve as the contact point for queries and as a platform for the structured exchange of information among the KEFs. It will do this by maintaining contacts, e.g. by means

## D. Results and future tasks of the Joint Committee

of information material<sup>116</sup> and surveys (Chap. B 2) among the contact persons and KEFs, as well as through the KEF forums (Chap. C 4) and specialised events on current topics (Chap. C 1 and C 2). In addition, it is constantly expanding and updating its extensive public online platform<sup>117</sup> (Chap. B 1). Combining the international conference “The Mystery of Risk – How can Science help reconcile perception and assessment?” with a student workshop in 2019<sup>118</sup> proved to be an effective method of raising awareness of the ethical aspects of security-relevant research among young scientists and of giving them insights into the tasks of the Joint Committee and the KEFs. Specialist events such as the conferences on “Biometrics and personal rights” and “Dual use in chemistry research” (Chap. C 1 and C 2) in particular contribute significantly to raising awareness of security-relevant research fields in the scientific community through the involvement of the relevant science associations.

The Joint Committee will also examine ways it can support the professional development and further training courses on ethical aspects of security-relevant research as requested by the contact persons and KEFs, and how it can best compile best practices for KEFs that go beyond the guidelines for the ethical assessment of security-relevant research (Chap. B 3.2). To this end, it will continue to analyse the positioning, organisation and procedures of the various KEFs that have been established so far.

## 2. Monitoring and needs-based advisory services for the KEFs

Between 2016 and 2021, the KEFs or comparable bodies addressed at least 94 security-relevant cases (Chap. B 2). Only seven of these cases were given a negative vote. The surveys showed that security-relevant research of concern as defined by the Joint Committee (Chap. A 1, Box 1) remains the rare exception in academic research, although there are numerous overlaps with other security-relevant issues. As outlined in Chapter B 2 and Chapter B 3, the KEFs are increasingly addressing the compatibility of research with constitutional principles, the basic regulations or guidelines of the respective research institution and with the “DFG Guidelines for Safeguarding Good Research Practice”. They deal with questions related to data protection and export control. The KEFs have also been asked to assess the security-relevant risks of research projects funded through sponsors with military ties or involving military secrecy, as well as security-relevant risks that arise from collaboration with researchers with military ties or from authoritarian states.

The Joint Committee is available to advise the KEFs on the challenging assessment of these issues, particularly when they fail to reach agreement on controversial securi-

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116 E.g. the information brochure “The Handling of Security-Relevant Research in Germany – An Overview” (2022). Available at [www.sicherheitsrelevante-forschung.org/en/publication-informationbrochure2022](http://www.sicherheitsrelevante-forschung.org/en/publication-informationbrochure2022) and collection of slides at [www.sicherheitsrelevante-forschung.org/bildung-lehre](http://www.sicherheitsrelevante-forschung.org/bildung-lehre) (each last accessed: 21 November 2022).

117 See [www.security-relevant-research.org](http://www.security-relevant-research.org) (last accessed: 21 November 2022).

118 For more information, see [www.sicherheitsrelevante-forschung.org/en/event-risks2019](http://www.sicherheitsrelevante-forschung.org/en/event-risks2019) (last accessed: 21 November 2022).

ty-relevant research projects. In such cases, the Joint Committee can provide contacts to suitable experts to advise them or set up regional forums where KEFs can exchange knowledge and experience. The Joint Committee will continue to collect the experiences from the advisory practice of the KEFs and process them accordingly.

At least 25 German research institutions are still discussing suitable procedures for the handling of security-relevant research on site or are still in the process of setting up a KEF (Chap. B 2). It should be possible to close this gap in the foreseeable future. Communication between contact persons and the Joint Committee office revealed that the prospect of setting up a KEF is frequently initially regarded as an additional bureaucratic burden and an obstacle for academic research. In many of these cases, in-depth discussions and the events held by the Joint Committee have allowed the contact persons to see the advantage of having a KEF as an advisory service for researchers and as an ethical safeguard and backing for their research projects. Other advantages are 1) promoting the ability to reflect by including other disciplines, 2) the ethical classification of a project as a possible funding requirement, 3) increasing the transparency of research with the aim of strengthening the public's trust in research freedom, and 4) the role of KEFs as an instrument of crisis management should risks of misuse unexpectedly come to light in a research project. The Joint Committee and its office will continue to work towards the establishment of further KEFs or comparable solutions at the remaining 80-odd relevant German research institutions (above all universities of applied sciences) and offer advisory services where needed.

In line with its mandate (Chap. B 1), the Joint Committee will recommend the establishment of an ad-hoc working group to the Leopoldina presidium in matters of overriding relevance. In close collaboration with the Joint Committee, this working group will then conduct an in-depth risk-benefit assessment and draw up a statement with recommendations on the further course of action. Here too, the Joint Committee will carefully analyse emerging security-relevant research areas to identify any need for action.

### 3. Measures to raise awareness for security-relevant aspects of research

The designation of numerous contact persons and committees as responsible for the ethical aspects of security-relevant research and the discussions this has triggered at the research institutions can already be regarded as an advancement in raising awareness for security-relevant aspects in research. In the Joint Committee's latest survey (Chap. B 2), however, more than half of those surveyed rated the visibility of the KEF at their own institution on a scale of 0 (not visible at all) to 100 (very visible) as 50 or even much lower (see also Appendix 3, Question 13). If researchers are not aware of the ethical dimensions of security-relevant research and the procedures that apply at their institution, they will hardly consult the KEF in potentially security-relevant cases. Individual discussions with researchers have also revealed that some of them do not want to consult their local KEF because they were worried that it would disproportionately influence the content of their research. The Joint Committee will therefore continue to focus particularly on providing support to raise awareness and clarify the issues involved, including through KEF forums, subject-specific events and student workshops, by providing suitable event concepts, contacts to suitable speakers and by developing additional communication materials<sup>119</sup> to support the work of the KEFs.

As set out in Chapter 4.3, the DFG refers to the handling of security-relevant research on its website and in its guidelines for submitting proposals. Funding applicants are required to check their projects accordingly. The application must also include a statement on the risk-benefit ratio and risk minimisation measures in the event that the project entails security-relevant risks. With these measures, the DFG is also contributing to raising awareness for security-relevant research among researchers. The Joint Committee will support the DFG in the analysis and assessment of the submitted projects. The DFG can further develop its guidelines so that these can be implemented as required and achieve the greatest possible acceptance. The reviewed DFG Guidelines for Safeguarding Good Research Practice also explicitly refer to the responsibility of the university and non-university research institutions to ensure compliance with regulations by their members and associates in security-relevant research and to foster compliance with suitable organisational structures.

As education has a decisive influence on young researchers, the increasing integration of security-relevant aspects in all relevant courses of study at universities is a key step in raising awareness (Chap. B 4). The Joint Committee will work to support this process by mobilising the contact persons and the KEFs and by providing new teaching materials on the subject. Furthermore, an event on awareness-raising and competence-building for ethics of security-relevant research in teaching is planned for 2023

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119 See also the information brochure "The Handling of Security-Relevant Research in Germany – An Overview" (2022). Available at: [www.sicherheitsrelevante-forschung.org/en/publication-informationbrochure2022](http://www.sicherheitsrelevante-forschung.org/en/publication-informationbrochure2022) (last accessed: 21 November 2022); and collection of slides at [www.sicherheitsrelevante-forschung.org/en/education-and-teaching/](http://www.sicherheitsrelevante-forschung.org/en/education-and-teaching/) (will be available in English from February 2023).

in cooperation with the German Rectors' Conference, which will include theories and methods of didactics and good practices. In a further step, requirements for appropriate basic ethical training of working group leaders are to be identified, for example as part of an event.

### 4. Further cooperation projects of the Joint Committee

The Joint Committee remains open to approaching more researchers from industry in the future, for example via industry umbrella organisations such as the Association of German Engineers (VDI), the German Association of Biotechnology Industries (DIB) and the German Chemical Industry Association (VCI). However, the procedures successfully used in the academic sector for the handling of security-relevant research have so far not proven particularly suitable for the private sector. The Joint Committee continues to be in regular contact with science associations such as the German Chemical Society, the Society for Virology and the German Informatics Society.

The approach of self-governance in the area of security-relevant research as advocated by the Leopoldina and the DFG is also attracting increasing international attention. In response to requests, the head of the Joint Committee's office presented this approach to several relevant stakeholders, such as at a forum of Europe's National Ethics Councils in 2017, at the annual expert meetings on the United Nations Biological Weapons Convention in 2018 and 2019, at the OECD<sup>120</sup> in 2021 and at the Dual-Use Working Group of the Flemish Universities in Belgium in 2022. In addition, the Joint Committee's work was discussed as a model with diplomatic delegations from Tunisia, Bahrain, Australia and the UK, as well as in two WHO working groups on the responsible use of the life sciences (Chap. A 5.1).

It is important to maintain the international exchange on topics such as export control in science and on ethical approval as a condition for international funding programmes. For this purpose, the Joint Committee will work towards strengthening its international collaboration with partners such as the European Commission and the United Nations as well as its communication with the Federal Foreign Office, the Federal Ministry for Education and Research, the Federal Ministry for Economic Affairs and Climate Action, the BAFA and the Robert Koch Institute. Issues arising in the area of IT research and robotics (Chap. A 5.2) and in international research collaboration with countries such as China, Russia and the United States (Chap. A 4.1) require particular attention and monitoring. In the case of the latter, the Joint Committee is already in exchange with the Alliance of Science Organisations in Germany and the Federal Ministry of Education and Research. It will work on the one hand to ensure compliance with new regulations and, on the other, to prevent any disproportionate restrictions on scientific freedom.

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120 In the following report "Integrity and security in the global research ecosystem", several references are made to the activities of the Joint Committee. Available at: [www.oecd-ilibrary.org/deliver/1c416f43-en.pdf?itemId=/content/paper/1c416f43-en&mimeType=pdf](http://www.oecd-ilibrary.org/deliver/1c416f43-en.pdf?itemId=/content/paper/1c416f43-en&mimeType=pdf) (last accessed: 28 September 2022).

# Appendix

## 1. Case studies to illustrate security-relevant research of concern

### **Case study 1: Is the production of synthetic, infectious smallpox viruses an instruction manual for constructing biological weapons?<sup>121</sup>**

A research group intends to produce infectious horsepox viruses by introducing a synthetically constructed horsepox genome into cells infected with an innocuous rabbit virus. The innovative value of this project is primarily the realisation of a complex technical process of synthesis, as the theoretical feasibility of this kind of experiment has long been accepted. The researchers argue that new vaccines against various smallpox viruses could then be developed using this procedure. The main risk of the project is that the technology can be used for the production of human pathogenic smallpox viruses. However, the human pathogenic smallpox virus (variola) has been eradicated since the 1980s, and good vaccines have long been available. The researchers' argument could gain new relevance in light of the spread of so-called monkeypox. On the other hand, as the project requires an extremely high level of expertise and technology, the experiment cannot be readily copied.

### **Case study 2: Can AI methods to identify and rectify software vulnerabilities make things easier for criminal hackers?<sup>122</sup>**

The proposed research project aims to systematically identify vulnerabilities in computer programs, particularly in the operating systems of Wi-Fi routers, smartphones and laptops using AI methods and to develop automated defensive measures. The results of this research project would come in useful everywhere where these computer programs need to be monitored and updated regularly. At the same time, the results would allow the identification and exploitation of these vulnerabilities in numerous devices that are not regularly monitored and updated. A notable example in this context is the ransomware WannaLaugh. It is constantly updated with new vulnerabilities and used to blackmail users of vulnerable IT devices. The results of the research project could undoubtedly be used to make WannaLaugh even more damaging.

121 See Noyce, R. S., Lederman S. and Evans, D. H. (2018). Construction of an infectious horsepox virus vaccine from chemically synthesized DNA fragments. PLoS One, 13(1):e0188453.

122 See report "The Malicious Use of Artificial Intelligence: Forecasting, Prevention, and Mitigation". Available at: <https://arxiv.org/pdf/1802.07228> (last accessed: 28 September 2022).

### **Case study 3: Is the detection of the sexual orientation of humans from photographs using deep learning algorithms a tool for illegal invasions of privacy?<sup>123</sup>**

This research project wants to further develop a deep learning algorithm to identify patterns in facial images. The project plans to train the algorithm using photos of openly homosexual and heterosexual individuals so that it can analyse other portrait photos to predict sexual orientation. The benefit of the project according to researchers is to find out how deep learning algorithms connect data and what reference points they select to make predictions. Purported additional benefits are furthering our understanding of the physiological correlates and origins of human sexual orientation and the limits of human perception. The risk of malicious application lies in the possible illegal acquisition of sensitive personal data using the biometrics of individuals, for example in countries in which homosexuality is criminalised. This research also opens the doors to racial profiling and is reminiscent of racial hygiene research under National Socialism using physiognomies. Highly developed deep learning algorithms of this kind could also be used to group people according to their consumer or voting behaviour or their criminal history.

### **Case study 4: Extracting sensitive information via brain-computer interfaces<sup>124</sup>**

The aim of the research project was to use non-invasive electroencephalogram (EEG) to identify brain regions responsible for storing and reproducing numbers, images and geodata. This could, for example, enable physically impaired persons to interact better with their environment, to carry out banking transactions by thought and without further input devices, or to communicate with other persons. The reliability of the extracted data has improved continuously during the experiments. However, if the technology is further developed, sensitive information could also be extracted in this way in the future, including passwords and bank data by means of harmless stimuli, so that misuse would be possible.

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123 See Wang, Y. and Kosinski, M. (2017). Deep neural networks are more accurate than humans at detecting sexual orientation from facial images. PsyArXiv.

124 Martinovic, I., Davies, D., Frank, M., Perito, D., Ros, T., & Song, D. (2012). On the feasibility of side-channel attacks with brain-computer interfaces. In 21st USENIX Security Symposium (Usenix Security 12) (pp. 143-158).

**Case study 5: Exploring pathways to radicalisation – Recruitment aid for terror groups?<sup>125</sup>**

The study explores the connection between the consumption of extremist (Islamist) material on the internet by young people and associated radicalisation. Previous research has already shown the great importance of the internet for the spread of radicalising material. This study additionally examines which characteristics make target persons particularly susceptible in this respect and which channels and media are particularly effective. For example, it is found that although video footage of beheadings is the most popular among young people, it has a low potential for radicalisation. In contrast, while online magazines of the so-called Islamic State and Al-Qaeda are only sought out by very few, they have the greatest cognitive effect. This is to provide insights for de-radicalisation strategies. At the same time, the results may be used by extremist and terrorist groups for more effective recruitment methods.

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125 Frissen, T. (2021). Internet, the great radicalizer? Exploring relationships between seeking for online extremist materials and cognitive radicalization in young adults. *Computers in Human Behavior*, 114, 106549.

## 2. List of contact persons and committees responsible for the ethical aspects of security-relevant research

The list is sorted by location (as of 2 September 2022). The current list is available at: [www.sicherheitsrelevante-forschung.org/en/contactpersons](http://www.sicherheitsrelevante-forschung.org/en/contactpersons) (last accessed: 1 November 2022). The contact persons are responsible for the entries themselves.

INSTITUTION	RESPONSIBLE COMMITTEE (OR STATUS OF COMMITTEE ESTABLISHMENT)	CONTACT	CITY	LAST UPDATED
<b>RWTH Aachen</b>	Rektoratskommission zur Aufklärung wissenschaftlichen Fehlverhaltens	Univ.-Prof. Dr. med. Dr. med. dent. Dr. phil. Dominik Groß	Aachen	23.04.2020
<b>Ostbayerische Technische Hochschule Amberg-Weiden</b>	Gemeinsame Ethikkommission der Hochschulen Bayerns (GEHBa)	Herr Dr. Martin Schmieder	Amberg-Weiden	05.01.2022
<b>Hochschule Ansbach</b>	Gemeinsame Ethikkommission der Hochschulen Bayerns (GEHBa)	Herr Dr. Martin Schmieder	Ansbach	05.01.2022
<b>Technische Hochschule Aschaffenburg</b>	Gemeinsame Ethikkommission der Hochschulen Bayerns (GEHBa)	Herr Dr. Martin Schmieder	Aschaffenburg	05.01.2022
<b>Hochschule Augsburg</b>	Gemeinsame Ethikkommission der Hochschulen Bayerns (GEHBa)	Herr Dr. Martin Schmieder	Augsburg	05.01.2022
<b>Universität Augsburg</b>	Ethikkommission	Prof. Dr. Werner Schneider	Augsburg	17.02.2020
<b>Otto-Friedrich-Universität Bamberg</b>	Bestehende Ethikkommission übernimmt Aufgaben einer KEF.	Prof. Dr. Thomas Weißer (Laubach)	Bamberg	27.11.2019
<b>Universität Bayreuth</b>	Bestehende Ethikkommission wurde um den Aufgabenbereich einer KEF erweitert.	Prof. Dr. Klaus Nagels	Bayreuth	25.09.2019
<b>Akkon-Hochschule für Humanwissenschaften</b>	Die Etablierung einer Kommission wird diskutiert.	Prof. Dr. Henning G. Goersch	Berlin	15.01.2017
<b>Berlin-Brandenburgische Akademie der Wissenschaften</b>	Kommission vorerst nicht geplant.	N.N.	Berlin	17.06.2021

INSTITUTION	RESPONSIBLE COMMITTEE (OR STATUS OF COMMITTEE ESTABLISHMENT)	CONTACT	CITY	LAST UPDATED
<b>Bundesinstitut für Risikobewertung</b>	Kommission vorerst nicht geplant. Fragen zu sicherheitsrelevanter Forschung werden in Fachgruppenbesprechungen adressiert.	Prof. Dr. Karsten Nöckler	Berlin	06.03.2020
<b>Charité – Universitätsmedizin Berlin</b>	Kommission für Ethik sicherheitsrelevanter Forschung etabliert gemeinschaftlich mit der FU Berlin	Frau Prof. Dr. Susanne Michl	Berlin	25.10.2022
<b>Deutsche Hochschule für Gesundheit und Sport</b>	Ethikkommission etabliert am 01.03.2021	Frau Prof. Dr. med. Meike Hoffmeister	Berlin	09.03.2021
<b>Deutsches Archäologisches Institut</b>	Vorerst keine Ethikkommission angedacht.	Prof. Dr. Friedrike Fless	Berlin	18.02.2020
<b>Freie Universität Berlin</b>	Kommission für Ethik sicherheitsrelevanter Forschung (gemeinschaftlich mit der Charité – Universitätsmedizin Berlin)	Frau Prof. Dr. Susanne Michl	Berlin	25.10.2022
<b>Gesellschaft für Informatik</b>	Noch nicht zugeordnet, wird ergänzt.	Stefan Ullrich	Berlin	17.03.2017
<b>Helmholtz-Zentrum Berlin für Materialien und Energie GmbH</b>	Bei Bedarf wird eine Ad-hoc-Kommission eingesetzt.	Dr. Ralf Feyerherm	Berlin	20.02.2020
<b>Hochschule für Wirtschaft und Recht Berlin</b>	Eine KEF ist vorerst nicht geplant.	Dr. Bettina Biedermann	Berlin	17.02.2020
<b>Humboldt-Universität zu Berlin</b>	Individuelle Kommissionen der Fakultäten	Prof. Dr. Peter Frensch	Berlin	15.04.2020
<b>Max-Debrück-Centrum für molekulare Medizin</b>	Kommission wird diskutiert.	N.N.	Berlin	15.04.2020
<b>Max-Planck-Gesellschaft zur Förderung der Wissenschaften e.V.</b>	Kommission für Ethik sicherheitsrelevanter Forschung (KEF), zuständig für alle Max-Planck-Institute	Thomas Dantes	Berlin	13.05.2022

INSTITUTION	RESPONSIBLE COMMITTEE (OR STATUS OF COMMITTEE ESTABLISHMENT)	CONTACT	CITY	LAST UPDATED
<b>Nationale Akademie der Wissenschaften Leopoldina</b>	Gemeinsamer Ausschuss zum Umgang mit Sicherheitsrelevanter Forschung	Dr. Johannes Fritsch	Berlin	18.01.2021
<b>Physikalisch-Technische Bundesanstalt</b>	Ethikkommission der PTB	Prof. Dr. Tobias Schaeffter	Berlin	21.02.2020
<b>Psychologische Hochschule Berlin (PHB)</b>	Kommission für Ethik sicherheitsrelevanter Forschung KEF (eingrichtet am 10.11.2015 durch Beschluss des Akademischen Senats der PHB)	Prof. Dr. Siegfried Preiser	Berlin	17.02.2020
<b>Robert Koch-Institut</b>	Bei Bedarf Ad-hoc-Kommission	Dr. Iris Hunger	Berlin	21.02.2020
<b>Stiftung Preußischer Kulturbesitz</b>	Kommission vorerst nicht geplant.	Prof. Dr. Stefan Simon	Berlin	29.04.2020
<b>Technische Universität Berlin</b>	Kommission zur Ethik in der Forschung (KEF)	Prof. Dr.-Ing. Stephan Völker	Berlin	20.05.2022
<b>Weierstraß-Institut für Angewandte Analysis und Stochastik</b>	Kommission für Ethik sicherheitsrelevanter Forschung etabliert seit Januar 2018	Dr. Andreas Rathsfeld	Berlin	21.02.2020
<b>Wissenschaftsgemeinschaft Gottfried Wilhelm Leibniz</b>	Leibniz-Kommission für Ethik der Forschung	Dr. Luzia Goldmann	Berlin	15.12.2021
<b>Universität Bielefeld</b>	Aufgaben der KEF werden von der Kommission für Forschung und wiss. Nachwuchs übernommen; entsprechende Verfahrensregelungen wurden am 28.7.2017 vom Rektorat beschlossen.	Prof.'in Dr. Angelika Epple	Bielefeld	23.05.2022
<b>Ruhr-Universität Bochum</b>	Kommission wird diskutiert.	Prof. Dr.-Ing. Andreas Ostendorf	Bochum	18.02.2020
<b>Technische Hochschule Georg Agricola</b>	Nicht vorhanden	Prof. Dr. Michael Prange	Bochum	15.04.2020

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<b>Rheinische Friedrich-Wilhelms-Universität Bonn</b>	Kommission zur Beratung sicherheitsrelevanter Forschung mit erheblichen Gefährdungspotenzial	Dr. Ines Heuer	Bonn	22.04.2020
<b>Deutsche Gesellschaft für Biophysik e.V.</b>	Kommission ist vorerst nicht angedacht.	Prof. Dr. Thomas Gutschmann	Borstel	18.02.2020
<b>Forschungszentrum Borstel, Leibniz Lungenzentrum</b>	Die Einrichtung einer institutsübergreifenden KEF mit zwei weiteren regionalen Leibniz-Instituten (HPI und BNTM) erfolgte am 07.12.17.	Prof. Dr. rer. nat. Ulrich Schaible	Borstel	20.12.2017
<b>Technische Hochschule Brandenburg</b>	Ethikkommission	Prof. Dr.-Ing. Sören Hirsch	Brandenburg an der Havel	17.11.2020
<b>Helmholtz-Zentrum für Infektionsforschung GmbH</b>	Kommission für Ethik sicherheitsrelevanter Forschung ist etabliert.	Prof. Dr. Dirk Heinz	Braunschweig	05.09.2018
<b>Julius-Kühn-Institut (JKI), Bundesforschungsinstitut für Kulturpflanzen</b>	Im Aufbau	Dr. Andreas Willems	Braunschweig	03.04.2020
<b>Leibniz-Institut DSMZ-Deutsche Sammlung von Mikroorganismen und Zellkulturen GmbH</b>	Das DSMZ verfügt über zwei Beauftragte für Ethik sicherheitsrelevanter Forschung, die entsprechende Fälle ad hoc und unverzüglich mit der Geschäftsleitung diskutieren, sodass eine zeitnahe Entscheidung ermöglicht wird.	Prof. Dr. Jörg Overmann	Braunschweig	19.02.2020
<b>TU Braunschweig</b>	Ethikkommission im Sinne einer KEF etabliert	Prof. Dr. Peter Hecker	Braunschweig	22.01.2020
<b>Leibniz-Institut für Präventionsforschung und Epidemiologie – BIPS</b>	Bei Bedarf Ad-hoc-Kommission	Alexander Knaust	Bremen	13.05.2022

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<b>Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung</b>	Risk Assessment Committee (RAC)	Dr. Klaus Grosfeld	Bremerhaven	03.04.2020
<b>Technische Universität Chemnitz</b>	Bei Bedarf übernimmt die Kommission für Forschung und Förderung des wissenschaftlichen Nachwuchses die Funktion einer KEF, bei zukünftig steigendem Bedarf wird über den Aufbau einer gesonderten Kommission nachgedacht.	Prof. Dr. Jörn Ihlemann	Chemnitz	09.02.2022
<b>Technische Universität Clausthal</b>	Kommission für Verantwortung der Wissenschaft und gute wissenschaftliche Praxis	Prof. Dr. René Wilhelm	Clausthal-Zellerfeld	21.06.2022
<b>BTU Cottbus-Senftenberg</b>	Ethikkommission der BTU	Dr. Rico Ganßauge	Cottbus	18.01.2019
<b>GSI Helmholtz-Zentrum für Schwerionenforschung GmbH</b>	Ad-Hoc Verfahren in Verdachtsfällen/r	Dr. Karin Füssel	Darmstadt	14.04.2020
<b>TU Darmstadt</b>	Ethikkommission (satzungsgemäßes Verfahren, auf der Basis einer Zivilklausel)	Prof. Dr. Petra Gehring	Darmstadt	18.02.2020
<b>Technische Hochschule Deggendorf</b>	Gemeinsame Ethikkommission der Hochschulen Bayerns (GEHBa)	Herr Dr. Martin Schmieder	Deggendorf	05.01.2022
<b>Technische Universität Dortmund</b>	Kommission wird diskutiert.	Prof. Dr.-Ing. Gabriele Sadowski	Dortmund	18.02.2020
<b>Technische Universität Dresden</b>	Senatskommission Forschung und wissenschaftlicher Nachwuchs, die den Bereich sicherheitsrelevante Forschung mit abdeckt und ad hoc durch Expertinnen und Experten erweitert werden kann	Prof. Dr. Angela Rösen-Wolff	Dresden	23.05.2022
<b>Heinrich-Heine-Universität Düsseldorf</b>	Kommission zum Umgang mit sicherheitsrelevanter Forschung (KSF)	Prof. Dr. Dr. Andrea Icks	Düsseldorf	25.11.2020

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<b>Friedrich-Alexander-Universität Erlangen-Nürnberg</b>	Kommission für Ethik sicherheitsrelevanter Forschung (KEF)	Prof. Dr. Georg Schett	Erlangen	30.11.2021
<b>Universität Duisburg-Essen</b>	Kommission wird diskutiert.	Dr. Anke Hellwig	Essen	11.03.2020
<b>Hochschule Esslingen</b>	Ethikbeauftragte/r	Prof. Dr. Sascha Röck	Esslingen	31.03.2020
<b>Georg-Speyer-Haus</b>	Beauftragter für biologische Sicherheit; bei Bedarf Ad-hoc-Kommission	Dr. Stefan Stein	Frankfurt	06.12.2017
<b>Europa-Universität Viadrina</b>	Ethikkommission	Prof. Dr. Wolff Heintschel von Heinegg	Frankfurt (Oder)	25.11.2021
<b>Dechema Forschungsinstitut</b>	Keine permanente Kommission im Sinne einer KEF verankert, bei Bedarf Ad hoc-Kommission	PD Dr. Mathias Galetz	Frankfurt am Main	18.02.2020
<b>Deutsche Industrievereinigung Biotechnologie im VCI e.V.</b>	Vorstand der Deutschen Industrievereinigung Biotechnologie	Dr. Ricardo Gent	Frankfurt am Main	21.04.2021
<b>Gesellschaft Deutscher Chemiker e.V.</b>	Bereits seit Gründung des Vereins gibt es ein „Ehrengericht“, welches bei Verstößen gegen die GDCh-Satzung und den Verhaltenskodex der GDCh aktiv werden kann.	Dr. Hans-Georg Weinig	Frankfurt am Main	19.02.2020
<b>Johann Wolfgang Goethe-Universität</b>	Die Universität hat eine Zivilklausel, die Eingang in die Grundordnung gefunden hat. Eine KEF gibt es derzeit nicht.	Dr. Kerstin Schulmeyer-Ahl	Frankfurt am Main	22.02.2019
<b>Leibniz-Institut Hessische Stiftung Friedens- und Konfliktforschung (HSFK)</b>	Bei Bedarf Ad-hoc-Kommission	Dr. Una Jakob	Frankfurt am Main	13.05.2022
<b>TU Bergakademie Freiberg</b>	Rektoratskommission Forschung	Prof. Dr. Jörg Matschullat	Freiberg	16.11.2020

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<b>Albert-Ludwigs-Universität Freiburg</b>	Kommission für Verantwortung in der Forschung	Prof. Dr. Stefan Rensing	Freiburg	13.05.2022
<b>Leibniz-Institut für Lebensmittel-Systembiologie an der Technischen Universität München</b>	Ethikkommission der Fakultät für Medizin der Technischen Universität München	Dr. Dietmar Krautwurst	Freising	05.10.2017
<b>Helmholtz-Zentrum Geesthacht, Zentrum für Material- und Küstenforschung GmbH</b>	KEF	Dr. Iris Ulrich	Geesthacht	20.02.2020
<b>Justus-Liebig-Universität Gießen</b>	Ständige Kommission zu sicherheitsrelevanter Forschung	Dr. Gunther Gerlach	Gießen	23.06.2021
<b>Universität Greifswald</b>	KEF-Satzung ab 01. August 2017 in Kraft	Prof. Dr. Micha H. Werner	Greifswald	19.02.2020
<b>Friedrich-Loeffler-Institut (FLI)</b>	Biorisk Ausschuss (IBC, Institutional Biorisk Committee)	Prof. Dr. Jens Peter Teifke	Greifswald-Insel Riems	19.02.2020
<b>Leibniz-Institut für Gemüse und Zierpflanzenbau</b>	Bei Bedarf Ad-hoc-Kommission	Prof. Dr. Philipp Franken	Großbeeren	22.11.2017
<b>Deutsches Primatenzentrum GmbH – Leibniz-Institut für Primatenforschung</b>	Kommission für Ethik sicherheitsrelevanter Forschung	Prof. Dr. Stefan Pöhlmann	Göttingen	23.01.2020
<b>Georg-August-Universität Göttingen</b>	2015 gegründete Ethikkommission der Universität (gem. der Leitlinie LHK Niedersachsen)	Prof. Dr. Peter-Tobias Stoll	Göttingen	06.07.2020
<b>FernUniversität in Hagen</b>	Ständiger Beauftragter und Ad-hoc-Kommission bei Bedarf	Prof. Dr. Jörg Keller	Hagen	25.11.2021
<b>Martin-Luther-Universität Halle-Wittenberg</b>	Kommission für ethische Fragen in der Wissenschaft	Prof. Dr. Wolfgang Paul	Halle	19.02.2020

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<b>Bernhard-Nocht-Institut für Tropenmedizin</b>	Leibniz Centre of Infection – KEF aus BNITM, HPI, FZB	Prof. Dr. Stephan Günther	Hamburg	13.05.2022
<b>Deutsches Elektronen-Synchrotron DESY</b>	DESY-Kommission für Ethik in der Forschung	Prof. Dr. Dr. hc. Ulrike Beisiegel	Hamburg	15.06.2021
<b>Heinrich-Pette-Institut, Leibniz-Institut für Experimentelle Virologie</b>	Richtlinien zur Sicherung guter wissenschaftlicher Praxis verabschiedet und veröffentlicht. Die Einrichtung einer institutsübergreifenden KEF mit zwei weiteren regionalen Leibniz-Instituten (BNTM und FZB) erfolgte am 07.12.17.	Prof. Dr. Gülsah Gabriel	Hamburg	08.09.2017
<b>Technische Universität Hamburg</b>	Akademischer Senat und Studiendekanatsausschüsse	Prof. Dr. Andreas Timm-Giel	Hamburg	19.02.2020
<b>Universität Hamburg</b>	Kommission für Ethik sicherheitsrelevanter Forschung wird diskutiert.	Dr. Harald Schlüter	Hamburg	10.02.2016
<b>Hochschule Hamm-Lippstadt</b>	KEF wird diskutiert.	Prof. Dr. Dieter Bryniok	Hamm	15.04.2020
<b>Gottfried Wilhelm Leibniz Universität Hannover</b>	Kommission für Verantwortung in der Forschung der Gottfried Wilhelm Leibniz Universität Hannover	Prof. Dr. Dietmar Hübner	Hannover	21.05.2019
<b>Hochschule für Musik, Theater und Medien Hannover</b>	Ständige Senatskommission für Ethikfragen	Prof. Dr. Eckart Altenmüller	Hannover	19.02.2020
<b>Medizinische Hochschule Hannover</b>	Senatskommission für Forschungsethik, etabliert seit August 2016	Dr. Jens Bohne	Hannover	19.02.2020
<b>Stiftung Tierärztliche Hochschule Hannover</b>	Kommission für Forschungsethik	Prof. Dr. Peter Kunzmann	Hannover	21.02.2020
<b>Deutsches Krebsforschungszentrum</b>	Der bestehende Ausschuss für Biologische Sicherheit am DKFZ wurde um den Aufgabenbereich einer KEF erweitert.	Dr. Timo Kehl	Heidelberg	11.11.2019

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<b>Ruprecht-Karls-Universität Heidelberg</b>	Kommission „Verantwortung in der Wissenschaft“ am 21.03.2017 beschlossen.	Prof. Dr. Jörg Pross	Heidelberg	19.02.2020
<b>Hochschule Heilbronn</b>	Erweiterung der Ethikkommission wird diskutiert.	Prof. Dr. Alexandra Reichenbach	Heilbronn	11.01.2021
<b>Hochschule Hof</b>	Gemeinsame Ethikkommission der Hochschulen Bayerns (GEHBa)	Herr Dr. Martin Schmieder	Hof	05.01.2022
<b>Technische Universität Ilmenau</b>	Forschungsausschuss der TU Ilmenau	Prof. Dr.-Ing. Stefan Sinzinger	Ilmenau	13.05.2022
<b>Technische Hochschule Ingolstadt</b>	Gemeinsame Ethikkommission der Hochschulen Bayerns (GEHBa)	Herr Dr. Martin Schmieder	Ingolstadt	05.01.2022
<b>Friedrich-Schiller-Universität Jena</b>	Kommission für sicherheits- und umweltrelevante Forschung	Prof. Dr. Georg Pohnert	Jena	25.10.2022
<b>Forschungszentrum Jülich GmbH</b>	Kommission für Ethik in der Forschung	Prof. Dr. Dieter Sturma	Jülich	30.11.2021
<b>Technische Universität Kaiserslautern</b>	Ombudsgremium für Ethik sicherheitsrelevanter Forschung (OEF)	Prof. Dr. Werner Thiel	Kaiserslautern	14.06.2021
<b>Leibniz-Institut für Neurobiologie Magdeburg (LIN)</b>	Ethikkommission	Prof. Dr. Peter Nick	Karlsruhe	20.02.2020
<b>Universität Kassel</b>	Zentrale Ethikkommission	Prof. Dr. Gerrit Hornung	Kassel	17.05.2019
<b>Hochschule Kempten</b>	Gemeinsame Ethikkommission der Hochschulen Bayerns (GEHBa)	Herr Dr. Martin Schmieder	Kempten	05.01.2022
<b>Christian-Albrechts-Universität zu Kiel</b>	Ethikkommission im Sinne einer KEF wird diskutiert.	Prof. Dr. Anja Pistor-Hatam	Kiel	15.05.2018
<b>FH Kiel</b>	Ethikkommission	Herr Prof. Dr. Thomas Rinder	Kiel	07.04.2021

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<b>GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel</b>	Kommission wird diskutiert.	Dr. Warner Brückmann	Kiel	04.09.2018
<b>Hochschule Koblenz</b>	Erweiterung der Kommission zur Sicherstellung ethischer Grundsätze und guter wissenschaftlicher Praxis wird diskutiert.	Frau Prof. Dr. Nicole Krautkrämer-Merk	Koblenz	21.04.2021
<b>Universität Konstanz</b>	Kommission für Verantwortung in der Forschung	Prof. Dr. Malte Drescher	Konstanz	20.02.2020
<b>Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR)</b>	Mögliche Kommission wird derzeit diskutiert.	Dr. Dirk Zimper	Köln	24.04.2020
<b>TH Köln</b>	Kommission zur Verantwortung in der Wissenschaft (KVV)	Frau Prof. Dr. Dagmar Brosey	Köln	08.02.2022
<b>Universität zu Köln</b>	Kommission zur Begutachtung sicherheitsrelevanter Forschung mit erheblichem Gefährdungspotenzial (FEG) eingerichtet.	Prof. Dr. Ute Höcker	Köln	03.04.2020
<b>Hochschule Landshut</b>	Gemeinsame Ethikkommission der Hochschulen Bayerns (GEHBa)	Herr Dr. Martin Schmieder	Landshut	05.01.2022
<b>Paul-Ehrlich-Institut – Bundesinstitut für Impfstoffe und biomedizinische Arzneimittel</b>	Ad-hoc-Kommission für Ethikfragen im Bereich sicherheitsrelevanter Forschung (Bestellung erfolgt fallspezifisch durch die Institutsleitung)	PD Dr. Stephan Steckelbroeck	Langen	24.11.2021
<b>Universität Leipzig</b>	Der bestehende Ethikbeirat wurde um einen Arbeitskreis „Dual-Use“ erweitert	Prof. Dr. Erich Schröger	Leipzig	27.07.2020
<b>Universität zu Lübeck</b>	Es ist geplant, die Kommission für Ethik und Verantwortung in der Forschung um den Aufgabenbereich einer KEF zu erweitern.	Prof. Dr. Christoph Rehmann-Sutter	Lübeck	20.02.2020
<b>Leibniz-Institut für Neurobiologie Magdeburg (LIN)</b>	Kommission für Ethik sicherheitsrelevanter Forschung	Prof. Dr. Constanze Seidenbecher	Magdeburg	14.12.2018

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<b>Otto-von-Guericke-Universität Magdeburg</b>	KEF im Gründungsprozess	Prof. Dr. Borna Relja	Magdeburg	16.11.2020
<b>Johannes Gutenberg-Universität Mainz</b>	Implementierung einer KEF wird diskutiert.	Prof. Dr. Stefan Müller-Stach	Mainz	27.02.2018
<b>Universität Koblenz-Landau</b>	Derzeit keine entsprechende Kommission an der Universität Koblenz-Landau vorhanden	Dr. Axel Koch	Mainz	29.04.2020
<b>GESIS – Leibniz-Institut für Sozialwissenschaften</b>	Ethikkommission	Prof. Dr. Marita Jacob	Mannheim	02.10.2018
<b>Universität Mannheim</b>	Das neue Statut der Ethikkommission der Universität Mannheim deckt sicherheitsrelevante Fragestellungen der Forschung ab und sieht für die Behandlung sicherheitsrelevanter Fragestellungen eine erweiterte Zusammensetzung der Ethikkommission vor.	Prof. Dr. Ralf Müller-Terpitz	Mannheim	20.02.2020
<b>Philipps-Universität-Marburg</b>	Kommission Forschung und Verantwortung	Prof. Dr. Ursula Birsl	Marburg	29.11.2018
<b>Hochschule Mittweida</b>	Ethikkommission	Herr Prof. Dr.-Ing. René Ufer	Mittweida	10.09.2021
<b>Fraunhofer-Gesellschaft</b>	KEF-Satzung verabschiedet, ad hoc KEF-Kommission etabliert		München	30.11.2021
<b>Institut für Mikrobiologie der Bundeswehr</b>	Zusammen mit dem Institut für Pharmakologie und Toxikologie und dem Institut für Radiobiologie der Bundeswehr wurde eine gemeinsame KEF eingerichtet.	PD Dr. Roman Wölfel	München	08.06.2020
<b>LMU München</b>	Kommission wird diskutiert/ ist in Planung.	Prof. Dr. Thomas Klapötke	München	20.04.2020
<b>Technische Universität München</b>	Bei Bedarf befassen sich einschlägige Ausschüsse der Fakultäten mit der Thematik.	Prof. Klaus Mainzer	München	28.11.2017

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<b>FH Münster</b>	Ethikkommission	Herr Prof. Dr. Stephan Barth	Münster	11.08.2021
<b>Gesellschaft für Virologie (GfV)</b>	DURC-Kommission der GfV	Dr. rer. nat. Linda Brunotte	Münster	30.11.2021
<b>Westfälische Wilhelms-Universität Münster</b>	Wird derzeit vom Ethikbeauftragten der WWU betreut; weitere institutionelle Ausgestaltung in Vorbereitung.	Prof. Dr. Franziska Dübgen	Münster	17.04.2020
<b>Hochschule Neu-Ulm</b>	Gemeinsame Ethikkommission der Hochschulen Bayerns (GEHBa)	Herr Dr. Martin Schmieder	Neu-Ulm	05.01.2022
<b>Universität der Bundeswehr</b>		Frau Univ.-Prof.'in Dr.-Ing. habil. Dr. mont. Eva Kern	Neubiberg	29.03.2022
<b>Helmholtz Zentrum München, Deutsches Forschungszentrum für Gesundheit und Umwelt</b>	Kommission ist in Planung.	Dr. Eva Reischl	Neuherberg	24.07.2020
<b>Deutsches Institut für Ernährungsforschung Potsdam-Rehbrücke (DIfE)</b>	Keine permanente Kommission im Sinne einer KEF verankert, bei Bedarf Ad-hoc-Kommission.	Dr. Petra Wiedmer	Nuthetal	18.02.2020
<b>Evangelische Hochschule Nürnberg</b>	Ethikkommission in Gründung	Prof. Dr. Arne Manzeschke	Nürnberg	29.11.2015
<b>Technische Hochschule Nürnberg</b>	Gemeinsame Ethikkommission der Hochschulen Bayerns (GEHBa)	Herr Dr. Martin Schmieder	Nürnberg	05.01.2022
<b>Carl von Ossietzky Universität Oldenburg</b>	Kommission für Forschungsfolgenabschätzung und Ethik	Prof. Dr.-Ing. Andreas Hein	Oldenburg	08.02.2019
<b>Universität Osnabrück</b>	Kommission für Forschungsethik hat sich konstituiert als Erweiterung der bestehenden Forschungskommission.	Prof. Dr. Peter Schneck	Osnabrück	13.05.2022
<b>Universität Paderborn</b>	Ethik-Kommission	Prof. Dr. Peter F. E. Sloane	Paderborn	19.11.2019

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<b>Universität Passau</b>	Kommission für Ethik in der Forschung	Prof. Dr. Jan Hendrik Schumann	Passau	18.09.2019
<b>FH Potsdam</b>	Ethikkommission in der Neuaufstellung	Prof. Dr. Tobias Schröder	Potsdam	16.04.2020
<b>Helmholtz-Zentrum Potsdam Deutsches GeoForschungs-Zentrum</b>	Bei Bedarf wird eine Ad-hoc-Kommission gebildet.	Marco Kupzig	Potsdam	19.02.2020
<b>Leibniz-Institut für Astrophysik Potsdam</b>	Einsatz einer Ad-hoc-Kommission bei Bedarf	Dr. Harry Enke	Potsdam	22.11.2017
<b>Universität Potsdam</b>	In der bestehenden Ethikkommission wurde ein Ausschuss für sicherheitsrelevante Forschung implementiert.	Prof. Dr. med. Dr. phil. Michael Rapp	Potsdam	21.02.2020
<b>Ostbayerische Technische Hochschule Regensburg</b>	Gemeinsame Ethikkommission der Hochschulen Bayerns (GEHBa)	Herr Dr. Martin Schmieder	Regensburg	05.01.2022
<b>Universität Regensburg</b>	Mandatserweiterung der bestehenden Ethikkommission der Universität Regensburg wird diskutiert.	Prof. Dr. Dr. André Gessner	Regensburg	21.02.2020
<b>Technische Hochschule Rosenheim</b>	Gemeinsame Ethikkommission der Hochschulen Bayerns (GEHBa)	Herr Dr. Martin Schmieder	Rosenheim	05.01.2022
<b>Universität Rostock</b>	Senatskommission Forschung übernimmt die Aufgaben einer KEF.	Prof. Dr. rer. nat. Udo Kragl	Rostock	21.02.2020
<b>Universität des Saarlandes</b>	Kommission für die Ethik sicherheitsrelevanter Forschung	Frau Dr. Verena Krenberger	Saarbrücken	01.07.2021
<b>Universität Siegen</b>	Rat für Ethik in der Forschung konstituiert am 01. Juni 2016.	Prof. Dr. Holger Foyssi	Siegen	21.02.2020
<b>Universität Hohenheim</b>	Senatskommission Forschung übernimmt ad hoc die Aufgaben einer Ethikkommission.	Prof. Dr. Julia Fritz-Steuber	Stuttgart	09.08.2018

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<b>Universität Stuttgart</b>	Kommission Verantwortung in der Forschung (Satzung und Richtlinie vom Senat am 18.1.2017 beschlossen)	Prof. Dr.-Ing. Peter Middendorf	Stuttgart	20.09.2018
<b>Hochschule Trier</b>	Kommission wird diskutiert.	Prof. Dr. Stefan Diemer	Trier	21.02.2020
<b>Universität Trier</b>	Ethik-Kommission	Daniel Bauerfeld	Trier	14.01.2021
<b>Universität Tübingen</b>	KEF-Kommission eingerichtet	Prof. Dr. Peter Grathwohl	Tübingen	21.02.2020
<b>Universität Ulm</b>	Senatskommission Verantwortung in der Wissenschaft	Prof. Dr. Florian Steger	Ulm	22.07.2020
<b>WHU – Otto Beisheim School of Management</b>	Die Kommission für gute wissenschaftliche Praxis wurde um den Aufgabenbereich einer KEF erweitert.	Prof. Dr. Utz Schäffer	Vallendar	06.03.2018
<b>Hochschule Weihenstephan-Triesdorf</b>	Gemeinsame Ethikkommission der Hochschulen Bayerns (GEHBa)	Herr Dr. Martin Schmieder	Weihenstephan	05.01.2022
<b>Pädagogische Hochschule Weingarten</b>	Bisher noch keine spezifische Kommission	Prof. Dr. Wolfgang Müller	Weingarten	13.09.2019
<b>Technische Hochschule Wildau</b>	Ethikkommission konstituiert am 2. Nov. 2015.	Anna Grebinyk	Wildau	24.10.2019
<b>Hochschule Worms</b>	Richtlinien zur Sicherung guter wissenschaftlicher Praxis verabschiedet und veröffentlicht. Zuständige Kommission etabliert, Mandatserweiterung für KEF in Diskussion.	Dr. Frank Möller	Worms	21.02.2020
<b>Bergische Universität Wuppertal</b>	Ethikkommission vorhanden, Erweiterung um den Aufgabenbereich einer KEF wird diskutiert.	Prof. Dr. Michael Scheffel	Wuppertal	21.02.2020
<b>Hochschule Würzburg-Schweinfurt</b>	Gemeinsame Ethikkommission der Hochschulen Bayerns (GEHBa)	Herr Dr. Martin Schmieder	Würzburg	05.01.2022

## Appendix

INSTITUTION	RESPONSIBLE COMMITTEE (OR STATUS OF COMMITTEE ESTABLISHMENT)	CONTACT	CITY	LAST UPDATED
<b>Julius-Maximilians-Universität Würzburg</b>	Kommission für Forschung und wissenschaftlichen Nachwuchs übernimmt Aufgaben einer KEF.	Prof. Dr. Hermann Einsele	Würzburg	29.04.2020
<b>Westfälische Hochschule Zwickau</b>	Ethikkommission	Prof. Dr. Torsten Merkel	Zwickau	24.11.2020

### 3. Joint Committee questionnaire on the handling of security-relevant research (from 1 December 2021; for reasons of space, the free response fields as well as the corresponding questions for cases 2 to 5 – questions 19 to 30 – have been deleted)

**Security-relevant research of concern** comprises scientific research work that has the potential to produce knowledge, products or technologies that could be **directly** misused by third parties to cause **significant** damage to **human dignity, life, health, autonomy, property, the environment or peaceful coexistence**.

All information is voluntary and treated confidentially. The information feeds into the overall survey results of all committees (commissioners) in Germany responsible for the ethical assessment of security-relevant research in anonymised form. This means that no names of individuals or specific institutions or specific details about the assessed research projects will be published.

#### Question 1

Name of university / research institution

#### Question 2

Type of university / research institution

#### Question 3

Contact details of the contact person responsible for the handling of security-relevant research

#### Question 4

Does your institution have a committee (commissioner) that is responsible for the ethical assessment of security-relevant research?

- Yes (continue with Question 6)
- No (continue with Question 5 and then with Question 31)

#### Question 5

Why does your institution not have a committee (commissioner) that is responsible for the ethical assessment of security-relevant research?

#### Question 6

When was the committee (commissioner) responsible for the ethical assessment of security-relevant research established?

**Question 7**

What is the title of the committee (commissioner) that is responsible for the ethical assessment of security-relevant research?

**Question 8**

What type of committee (commissioner) is responsible for the ethical assessment of security-relevant research at your institution?

- Permanent committee exclusively responsible for the ethical aspects of security-relevant research
  - Previously established committee that also covers the ethical aspects of security-relevant research
  - Committee without a fixed membership that is only convened when security-relevant cases are to be assessed
  - Committee used jointly with other research institutions
  - Commissioner responsible for the ethical aspects of security-relevant research
  - Other
- 

**Question 9**

Are the statutes of the committee (commissioner) responsible for the ethical assessment of security-relevant research at your institution available online?

- Yes, at the following address
- 

- No

**Question 10**

Which subject areas/groups are represented in your committee?

- Law
- Philosophy/theology
- Students
- Administration
- Other subjects

**Question 11**

How often did the committee responsible for the ethical assessment of security-relevant research convene in 2020/21?

**Question 12**

Which topics have so far been discussed by the committee responsible for the ethical aspects of security-relevant research?

- Security-relevant research projects
  - Events to raise awareness of ethical aspects of security-relevant research
  - Administrative procedures
  - Integrating the ethics of security-relevant research in education and teaching
  - Export control issues
  - Other
- 

**Question 13**

How would you rate the visibility of your committee on ethical aspects of security-relevant research for members of your institution? (0 = not visible at all; 100 = very visible, please tick)

**Question 14**

How many research projects were submitted to the committee or commissioner responsible for the ethical assessment or security-relevant research in 2020 and 2021?

Total research projects \_\_\_\_\_

**Question 15**

How many of these research projects were discussed as potentially security-relevant at the beginning of the consultation process? (Selection: 1–5 cases or more than 5 cases)

**Question 16**

Please name the subject/discipline and explain the facts for the first potentially security-relevant research project of concern (and for each case up to Case 5).

**Question 17**

What vote did the committee give for Case 1 (and for each case up to Case 5)?

- Approved
- Approved with conditions
- Partially advised against
- Advised against

**Question 18**

Please describe the relevant aspects that led to the above vote (and for each case up to Case 5).

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**Question 31**

What measures does your research institution undertake to strengthen awareness of security-relevant research aspects?

- Staff training
- Checklist for assessing research projects
- Integration in teaching
- Public events / discussion rounds
- Information on the website, at the following address:  

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- Actively contacting institution members about this issue (e.g. info mail)
- Other  

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**Question 32**

What measures is your research institution planning in order to increase the awareness of security-relevant aspects of research?

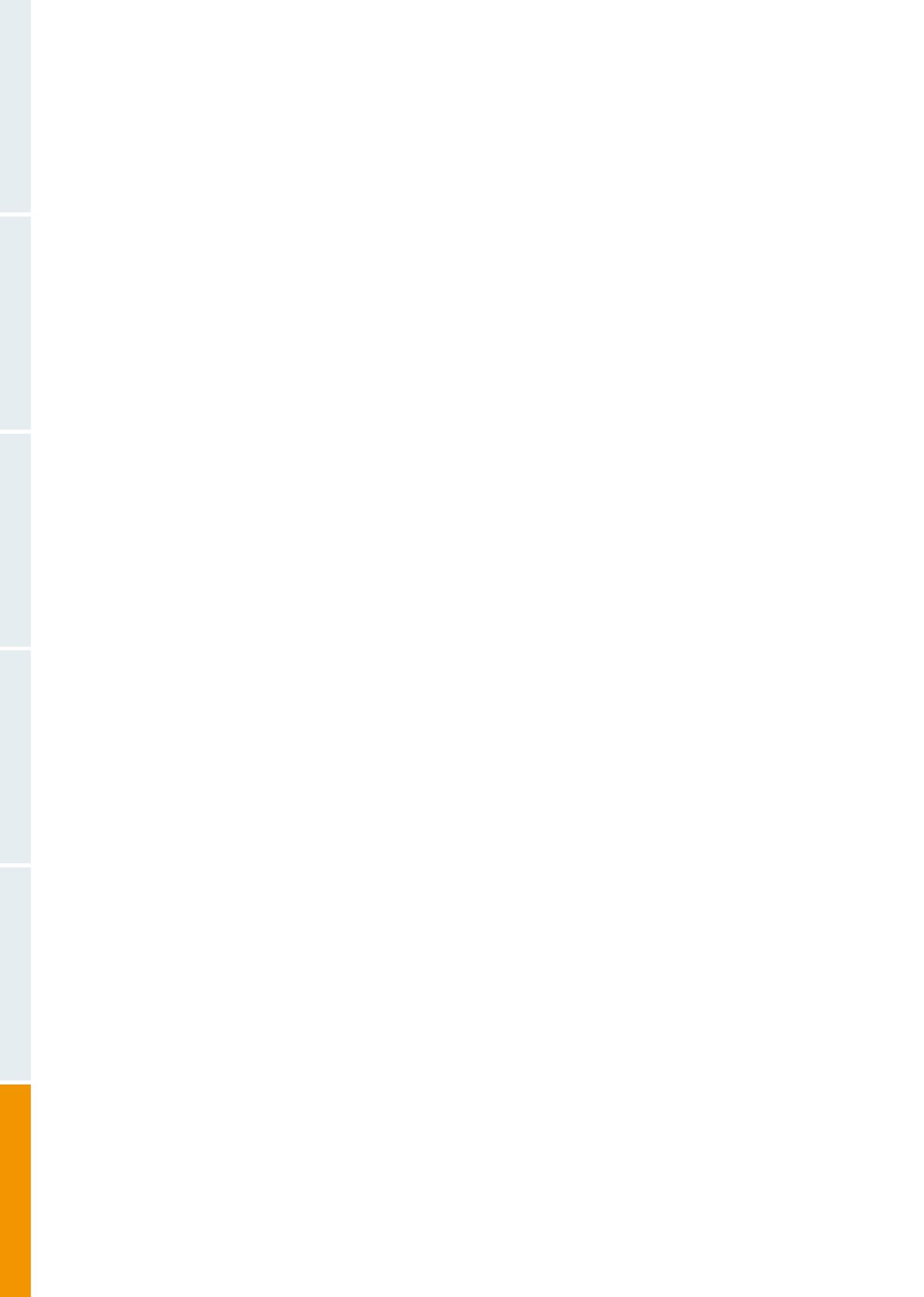
- Staff training
- Checklist for assessing research projects
- Integration in teaching
- Public events / discussion rounds
- Information on the website, at the following address:  

---
- Actively contacting institution members about this issue (e.g. info mail)
- Other  

---

**Question 33**

How could the Joint Committee on the Handling of Security-Relevant Research support your research institution? What are your suggestions for our future work? Would you like to draw our attention to any other security-relevant issues?





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The Leopoldina originated in 1652 as a classical scholarly society and now has 1,600 members from almost all branches of science. In 2008, the Leopoldina was appointed as the German National Academy of Sciences and, in this capacity, was invested with two major objectives: representing the German scientific community internationally, and providing policymakers and the public with science-based advice.

The Deutsche Forschungsgemeinschaft is the self-governing organisation for science and research in Germany. It serves all branches of science and the humanities. In organisational terms, the DFG is an association under private law. Its membership consists of German research universities, non-university research institutions, scientific associations and the Academies of Science and the Humanities.

The Joint Committee for the Handling of Security-Relevant Research was established by the DFG and Leopoldina to increase awareness of the dual-use potential of research findings, foster responsibility in handling security-relevant research, and strengthen self-governance on this issue within the scientific community.

[www.leopoldina.org](http://www.leopoldina.org) | [www.dfg.de](http://www.dfg.de)

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